THE

WESTERN JOURNAL

OF

MEDICINE AND SURGERY.

NOVEMBER, 1842.

ART. I.—*A Case of Compression of the Brain, reported to the Medical Society of Tennessee, at its 13th annual meeting in May*, 1842. By JOHN R. WILSON, M. D., of Davidson County.

Nancy, 32 years of age, the servant of Wm. H. Robertson, Esq., of Rutherford County, during the seventh month of her sixth pregnancy, was attacked with severe pain in the left side of the head, involving the temple, eye, &c., and with pain in the lumbar region, but not severe; her bowels were costive, tongue furred, pulse full and strong, appetite capricious. I bled her freely from the arm, administered a dose of castor oil, had a cold wet towel applied to her head, which had more than ordinary degree of heat. I visited her next day and found all the symptoms somewhat relieved; ordered light diet, and a repetition of the oil when necessary to prevent constipation. This course

enabled her to pass her time with only an occasional recurrence of pain in the left side of her head, to which she said she had been subject many years, until about three weeks after the birth of her child, at which time I was called to see her again and found her suffering from pain as in the first attack, with but little arterial excitement, surface cold and clammy, tongue much furred, left eye slightly inflamed, no appetite, tinnitus aurium, and bowels confined. An emetic of ipecac. was administered at noon, 15 grs. blue pill ordered at bed-time, to be followed by a dose of oil next morning. During the next morning I visited her again; the oil had operated, but every symptom was worse—a hard tumor, circumscribed and slightly elevated, was discovered on the left side of the os frontis; near the junction of the parietal bone; there was strong full pulse, hot skin, occasional aberrations of mind, intolerance of light and jactitation. I bled her copiously, but without any relief of pain; gave 20 grs. calomel, shaved the tumor, and ordered oil in six hours, with warm fomentations to the tumor and temple. I visited her next day and found all the symptoms better except the pain in the tumor, in which she complained of severe pain and throbbing. I applied a blister plaster over the tumor and administered a dose of senna and salts. Next day the blister had drawn well, and the tumor being now soft, I opened it by a large incision, when it discharged a considerable quantity of purulent matter. An emollient poultice was applied, and directions were given to repeat it, with a view to keeping the orifice open.

For two days after the opening of this tumor the patient appeared relieved. On the third day she became extremely restless and unable to sleep, with want of feeling in the right hand and arm, which gradually extended to the lower extremity of the same side. During the ensuing night complete paralysis of the right side took place, attended with laborious breathing and stupor. The patient returned no answer that could be understood to any question asked; pulse slow and oppressed, but regular. A free crucial incision was made through the tumor, and on examination a portion of the per-

icranium was separated from the skull, and a small hole was discovered sufficient to admit the end of a probe through the first table of the bone, but no farther. The trephine was applied immediately, and as soon as a portion of the bone had been removed, four or five ounces of purulent matter were discharged. This was in a short time followed by a return of the power of distinct articulation and of a correct sense of hearing, and the patient was soon able to answer any question asked. The bone had lost its natural appearance as far as the dura mater was detached, which was to some extent, and several crowns of the trephine were taken out, so as to remove as far as possible all the diseased bone, which resembled wood of very hard texture irregularly worm-eaten. The dura mater had a dusky red appearance. Simple dressings of the ordinary kind, with gentle laxatives and light diet, soon enabled the patient to recover her health, which has continued without much interruption up to the present time—a period of more than 14 years. I would further remark that the patient had not received any mechanical injury on her head, but was of a family disposed to scrofulous diathesis, some of her brothers having since died of that disease.

May, 1842.

Art. II.—*History of a fatal Case of Chronic Spinitis.* By Calvin Smith, M. D., of Toledo, Ohio.

On the 8th of October, 1841, Dr. Perkins of this place and myself were called, as consulting physicians, to visit Judge ——, aged 43 years. By enquiry into the history of his case, we learned that about the first of the previous June, he had, for a few days, labored very hard in his warehouse at his writing desk, as well as at other work, such as handling boxes, &c. About this time he was taken ill with rheumatism, and a considerable reduction of voluntary motion in his extremities, more especially the inferior. He called in his family phy-

sician, who bled and purged him freely, applied a blister to the spine, which was not, however, continued for any length of time, salivated him, and also had recourse to strychnine. Notwithstanding this treatment, the paralysis increased, until he had very little power over his extremities. At the end of three weeks it became necessary for his attending physician to leave town, when the patient passed into the hands of another, after which there was not the least attention paid to the spine —the new physician, together with the patient himself, not believing that the medulla spinalis was in the least affected. Recourse was then had to showering the limbs with cold water. In July there was a short period when he so far improved, that by the aid of a cane he could walk around the room, and even to a little distance out of doors, which gave him much encouragement; but his hopes were soon blasted by a relapse, and in a few days the paralysis was as great as it had been at any prior time. The showering of the limbs with cold water was now resumed; they were also rubbed with various liniments, and electricity and *animal magnetism* were resorted to. Tonics were likewise given, and in short, he tried many things which *quackery* only could invent, to the utter neglect of the spine and all proper constitutional treatment.

I was first called on the evening of October 8th, and found the patient very faint, with a great difficulty of breathing, and frequent eructations, which I was led to believe were owing to acidity of the stomach, in consequence of fermentation of food; particularly as I found his appetite was good, and that he had been allowed whatever articles he chose to eat. He was so much exhausted that I found it impracticable to give him a thorough examination, or indeed to examine his spine at all, that night. I therefore, for the purpose of correcting the acidity of the stomach, and relieving his faintness, recommended a dose of carb. ammon., and left him for the night. At 2 o'clock, P. M, on the 9th, I again called and found that he soon became more comfortable on taking the ammonia, and had passed a tolerable night, and that he was free from the difficulty of breathing, which he labored under the night pre-

vious, and able to undergo the necessary examination. I first turned my attention to the paralyses, and found the power of volition wholly gone in his upper and lower extremities, with the exception of the left fore-arm, which he was able to move imperfectly. He had no power over the abdominal muscles, and consequently his stools were involuntary, or only brought about by the natural action of the intestines wholly independent of the will. He could, however, void the contents of the bladder at will. There was some degree of sensibility in the extremities, but it was very much impaired. His mental powers were apparently in a healthy condition. He had the power of moving the head perfectly, and his shoulders to some extent. The powers of speech and deglutition were perfect, and so also were all the senses. He had experienced some pain a great proportion of the time in the back and extremities. The pain had, however, very much abated at this time, but the greatest caution was required in turning or moving him in bed, on account of the pain it produced. In view of the above symptoms, I was naturally led to infer that the medulla spinalis was materially affected, and on examination by pressure found that much pain was produced when pressure was made upon the cervical vertebræ. There was also some tenderness along the dorsal vertebræ, but nothing like the amount which existed in the cervical region. On pointing out this tenderness to the attending physician, he for the first time became satisfied, that the spinal marrow was affected—having, till now, with several others who had been called to see the patient, attributed the difficulty to some inexplicable affection of the nerves. I advised immediate counter irritation along the spine, with such constitutional treatment as might be indicated at this stage of the disease, together with a regulated diet.

Dr. Perkins concurring with me in opinion, the tartar emetic plaster was applied along the spine. On the morning of the 11th I was again called, and requested to take the whole charge of the patient myself. On entering the room I found there was much difficulty of breathing, which in fact brought

into action the sterno-cleido-mastoid muscles. The other symptoms were much as they were on the 9th, with the exception of his being somewhat more exhausted. I was now convinced the spinal marrow was affected as high as the origin of the respiratory nerves, and also felt satisfied that he could not long survive, and might drop off very suddenly, of which I apprised the friends.

I resolved, however, to leave nothing undone which might possibly be of any avail. I removed the plaster from the back, which I found somewhat red, and applied nitric acid for the purpose of producing an immediate effect.

The respiration, however, became more difficult, continually bringing into action more and more of the respiratory muscles which in a healthy state are dormant. The strength gradually failed, although stimulants were admistered freely, until about 11 o'clock, P. M., when he expired.

His mental powers and the functions of speech were perfect to the last. He voided his urine not to exceed twenty or thirty minutes before he ceased to breathe, and appeared to have perfect control over the bladder. He expired without a struggle, and in fact every thing had just the appearance of the respiratory muscles quietly ceasing to act. The bowels moved once or twice a day, without the aid of laxatives, from the time I saw him till his death, which I was informed had been the case for some time previous. The stools did not vary in appearance from what we find them in perfect health. He did not lose control of the bowels until the last two or three weeks of his life. After this time he had a perfect sensation of the movement of the bowels, but had not the least control over them or the sphincter. It was suggested by a gentleman, who had been his family physician prior to coming to this section of country, and who had seen him during his last illness, that it was a scrofulous affection of the spinal marrow. He was led to this opinion from the fact that some seven or eight years prior to this attack, the patient had a carious affection of the sternum, from which however he recovered as soon as exfoliation took place, and from which time he has not la-

bored under any inconvenience. The patient attributed this affection of the sternum to his having been for several years previous constantly engaged at the writing desk. On inquiry I found that there had never been the least symptoms of a scrofulous diathesis before the system had become perfectly matured, and that the only thing which could lead one to suspect it, was the affection of the sternum. From all the facts, I was led to believe that the remote cause was not of a scrofulous character. I will also here remark, that four or five years previous to this last illness, he had frequently suffered very much with the common intermitting and remitting fevers which have been so prevalent in this section of country, and also, that he had taken very liberally of tonics, particularly the sulph. quinine, and I strongly suspect without proper attention having been paid to the hepatic system.

On examination after death, the vertebræ were laid open from the occiput to the lumbar region. On puncturing the membranes which enclose the medulla spinalis, water gushed out very freely, and they were found to be considerably injected with blood, a sufficient proof of inflammation. The vertebræ and interosseous substance were perfectly healthy, which to my mind clearly established the fact, that the disease was not of scrofulous origin. I desired to examine the brain, but did not, as there was some objection to it on the part of the friends.

August, 1842.

ART. III.—*Observations on Scarlatina Anginosa, as it appeared at St. Clairsville, Ohio, in* 1833. By THOMAS CARROLL, M. D., now of Cincinnati.

Before I bring to the reader's consideration the disease which is the principal object of this essay, I will make a few observations on the anginose affections, with scarlatina, that preceded the year 1833.

My own observation will not enable me to say much about those diseases anterior to the year 1829; and *nothing* farther back than 1824. From that year until 1829 scarlatina was not observed by me, but angina maligna occasionally prevailed, and often proved fatal.

During the winter of 1828—9 scarlatina simplex first made its appearance at St. Clairsville, and in a few localities in its neighborhood. During that winter I did not lose a single case, though the efflorescence in most cases was general, and somewhat intense in its character. Indeed, my success was such as to inspire me with great confidence in the treatment of that too often unmanageable disease; but alas! time soon brought down my arrogance, and taught me, that, like epidemic cholera, this disease often sets at defiance the best directed efforts of our art.

From this period until 1833, scarlatina almost constantly prevailed, either at St. Clairsville or in various surrounding localities, as well as at different places in the belt of country lying between the Ohio and the Muskingum rivers, where it occasioned great mortality, though at St. Clairsville but very few fatal cases occurred. Indeed that town and its vicinity has at no time suffered with the same severity as many other places around it. Of those who died in 1833 many were adults, among whom were persons of such note in society as to attract attention to the prevailing mortality, and perhaps make it seem greater than it really was.

This epidemic of 1833 is that to which I desire to direct the reader's attention, as its character was different from any type of scarlatina I have ever seen. It commenced in February, declined in July, but did not terminate until August. Its character changed with the state of the season, being more intense in hot than in cool weather. This remark will at least hold good with regard to those cases which originated in cool weather, which instantly got worse, if any considerable rise of the thermometer suddenly took place, especially if they had been sick from one to four or five days. So well did I understand this matter, that on one occasion, when a sudden change

of temperature from cold to warm occurred, I predicted its sinister effect on my patients; and within a week I lost five adults in town. This fact, in connexion with others, warned me to avoid heated and close rooms in the treatment of this disease; indeed, I am not certain but heat is as injurious in the this disease as in small-pox. When scarlatina commences during hot weather, the cases often do well; or if it commence in warm, and terminate in cold weather, I think it is not aggravated by the change.

The first appearance of the disease in February was characterised by inflamed fauces, elevated and reddened papillæ of the tongue, with swelling of the mucous membrane generally, slight salivation, headache, rigors, fever and delirium. The fever, in most cases, was accompanied with an unusually strong and frequent pulse, and great heat of the surface, but almost altogether without eruption of the skin. This condition lasted from four to seven days; when, if the patient did well, the symptoms abated, and he was convalescent by the tenth day. When the result was unfavorable, a singular, and to me, new set of symptoms supervened with continued delirium, and other signs of inflammation of the brain.

As the season advanced, these symptoms became united with other and more serious ones, that frequently bade defiance to all the efforts made to stop their fatal tendency; and were mostly brought on by imprudence of the patients after they had pretty well recovered from the severity of the disease, by active treatment at the outset followed up by abstemiousness and quiet. When by these means the patient was so far restored as to go about the house and resume his usual habits, some irregularity in eating and drinking, or the exposure of himself to cold and wet, or even washing in cold water, has brought on the following symptoms: Fever, with a revival of the inflammation of the fauces, frequently travelling up the posterior nares, and involving the whole pituitary membrane, and the sub-mucous cellular substance; and at length attacking the skin above. The first appearance of inflammation of the last, was mostly observed on the bridge of

the nose; the centre of it being at the termination of the ossa nasi, and forming a belt across the nose, about three fourths of an inch wide, with an apex resting on each cheek, though sometimes there was but one. This inflamed belt either crossed one or both cheeks; and when it only travelled across one side of the face it invaded but one ear; but if the contrary, both were involved in the difficulty. The swelling spread from this belt, and mostly the whole face and scalp became involved in the tumefaction; though, where the inflammation spread on one side of the nose and only crossed one cheek, but one side of the face swelled, and no part of the scalp inflamed. The color of the skin was red, more or less approaching a venous hue, and during a few of the first hours had a polished aspect: but vesication uniformly resulted in a short time, and spread over the face and ears, but did not invade the hairy scalp to much extent; which union of the vesication and swelling completed every characteristic of erysipelas, and was accordingly treated as such. Abscesses also formed about the head, and I know no instance of death when they arose.

This condition in those who survived it, lasted about ten days before the swelling materially moderated; when it gradually yielded, and the patient recovered his usual health; and, so far as I saw, no return of erysipelas took place. But nearly half of those who were thus diseased, never recovered; inflammation of the brain having eventually carried them off, and that mostly within the first week or ten days from the commencement of the erysipelas.

In most cases the lips and tongue swelled until articulation was either difficult or impossible, and the tumefaction extended over the face and scalp until the eyes were so buried beneath that vision was impossible. Abscesses frequently formed either in the upper eyelids or in the scalp, each of which contained about a tea-spoonful of pus when fully matured. It is singular that no case of death took place, as I have just said, when these abscesses formed about the head; which was not the case when they supervened on the extremities. Other

and more appalling symptoms occurred in a number of cases, the result of which was the death of every one in whom they were developed. These consisted in swellings of the extremities that mostly terminated either in suppuration or mortification. They were confined to the cellular substance both exterior to, and beneath, the fascia surrounding the muscles; and in one or two instances, in the larger joints. In the cases which terminated in suppuration, healthy pus was not formed; but a thin darkish matter approaching to green, was the result. Amidst this matter there was, in nearly every case, a quantity of fibrin closely adhering together, and forming a substance more or less extensive according to the size of the abscess. Their common length was from three to six inches; their width one and a half or two, and their thickness from three to five lines. These substances adhered so closely together, that I generally succeeded in drawing them out of the orifices made for the exit of the matter. To give a clearer idea of the nature and effect of these abscesses, I subjoin the two following cases.

A gentleman, aged about 65, was taken in the usual way, and did not at first seem very ill. He would take no medicine, nor submit to depletion by bleeding, and indulged in eating whatever he wished. He continued to have fever after the time it usually subsided, and at the end of three weeks he suddenly complained of pains in the calves of the legs, which on examination were found to be swollen, particularly on the inner sides. Soon after, both his fore-arms inflamed and one of his elbows, and all went on to suppuration; abscesses forming on the inner side of each leg and arm, and one round the elbow joint. When the matter was discharged four fibrinous substances were drawn from four of them. After this, they all healed, and a sixth formed low down on the right side. This abscess was very large and extremely painful. It connected itself slowly with the walls of the abdomen, which rendered it easy to reach the matter with an instrument; but I long hesitated before I opened it, as I thought that death would soon follow the evacuation of the pus. The ear-

nest solicitations of the patient, however, overcame my hesitation. I opened it, and my patient within seventy-two hours paid the debt of nature, after having suffered a most painful disease during three months. About ten days from the commencement of this patient's illness, his wife died of mortification of two of her extremities by the same disease.

A lady aged 35, had at the commencement the usual symptoms, and in the course of a week seemed to be rapidly recovering. She returned to her ordinary occupations, which exposed her too much. The febrile symptoms recurred, and the inner surface of each fore-arm inflamed and suppurated. I opened the abscesses, and drew out of each strips of fibrin. These abscesses eventually healed, and the patient again seemed to be doing well; but, of a sudden, pain and swelling of the side of the head, with fever and delirium set in; and before suppuration took place death ensued, in about five weeks from the first attack.

Five cases terminated in mortification. In two of the patients the arm was its seat; and in one of these it also attacked the leg. Three others had one leg each mortified. The first of those affected in the arm seemed to have had the mortification brought on by bleeding, as pain at the bend of the arm, with inflammation of the orifice, and swelling of the limb, took place within 24 hours after the operation. The patient lived only three days after the commencement of sphacelation, which within that time involved the greater part of the arm. In a few days afterwards, however, I was called to prescribe for the sister of this patient, a lady advanced to the 65th year of her age, though ten years younger than her brother. When I examined her, my impression was so strong that she must be bled, that I proposed taking blood; but my patient refused, on the ground that she thought her brother had fallen a victim to bleeding. My reasons for wishing to bleed were, that she had an uncommonly strong pulse, pain in the head, hot and dry skin, and soreness of the throat; but the repugnance of my patient, and the melancholy termination of the last case caused me to yield; and I made the best prescrip-

tion I could under the circumstances. On the following day, to my great astonishment, I found the arm, out of which I had intended to draw blood, considerably swollen and very painful, and the leg of the same side in the same condition. The color of the limbs was slightly venous; indeed, venous congestion was very obvious. At my next visit, 24 hours after, I found both limbs affected with incipient mortification. Another day brought about a fatal termination.

In the three remaining cases, the arms escaped, and but one extremity was affected in each. Great pain was experienced in the inflammatory stage. This state of suffering lasted but a short time, probably not much over 36 hours, in any of the cases; when other symptoms, less painful but equally distressing, supervened. One of these cases was that of an intemperate colored man, about 35 years of age. Another that of a lady advanced to the sixtieth year of her age, whose constitution had been broken up by long continued disease. The third and last had sound health up to the time of her fatal attack; she was a poor and laborious woman. They all died.

The inflammation in the above cases was no doubt of the erysipelatous character; and its malignity arose from its close connection with a masked form of the scarlatina.

Not less than five pregnant females became affected with the epidemic of 1833, and one case of a similar kind occurred in 1834, of which all but one proved fatal about the fifth or sixth day.

The first case I saw in consultation. The lady had been ill three or four days, and had been taken with a violent rigor, which was succeeded by intense fever, accompanied by pain of the head, back, throat and chest; and after the continuance of this for some hours, another rigor followed, which was again succeeded by fever. When I first saw this patient I determined in my own mind that the death of the fœtus had taken place, and that abortion would not follow without proving fatal to the mother. Abortion did not take place, but death supervened in six hours. She was advanced in pregnancy to the fifth month. The death of the fœtus took place in every

fatal case but one, before miscarriage. Abortion was the result in only two cases; and one child was born at full time on the third day of the disease. This child is still living, and has in the main good health. On the evening that the child was delivered the mother observed an inflamed spot on her fore-arm, just above the wrist, in which the cellular membrane was involved. When she observed it, she said that she would not live, as all who had been thus affected had died; and her prediction was verified in a few days. The lady who recovered had visited her friends in town, some of whom were affected with the worst forms of the disease. She became but slightly affected, and by taking much care, recovered and gave birth to a fine child, some months afterwards.

Of the contagious nature of this disease I have but little doubt, and what is most singular it propagated the scarlatina anginosa. For instance, a gentleman and lady had that disease, combined with erysipelas, which proved fatal. Their children, who lived at some distance, visited them, and some days after their return home several of them were taken ill with it; but none of them had erysipelas in any form; those, however, of their neighborhoods, who visited them, and became diseased in a similar way, in two or three instances had erysipelas of the face; yet no such disease took place among others in that region, who were not exposed to the contagion.

This same gentleman and lady were visited by a lady who lived in another section of the country; and she also had the affection with erysipelas of the face. Her daughter had the disease combined with erysipelatous inflammation; while several others of the family had it uncombined with that dangerous symptom.

At a number of places through the country, scarlatina existed in its simple or malignant form; but in no place did the same phenomena present themselves as in St. Clairsville and its immediate neighborhood. I saw two cases, however, during the same season, in which two thirds of the nose was involved in an inflammation that had travelled up the schneiderian mem-

brane from the fauces. There was, however, but very little swelling and no vesication. In both cases death was the consequence.

It not unfrequently happens, that a tendency to erysipelatous inflammation is manifested in the eruptive stages of scarlatina, as a result of bleeding or blistering. As an evidence of this I will relate the following case. My friend and former student, the late Dr. W. Wright, of eastern Ohio, informed me, some years ago, that he had, during his residence in Guernsey County, bled a patient laboring under scarlatina, and that the orifice healed in about the common time; but the patient did not recover with the usual rapidity, and in about two weeks the orifice which had seemed entirely well, suddenly ulcerated, and the inflammation rapidly spread and soon involved the whole arm, which terminated in mortification.

We now arrive at the treatment of this disease, which was at least characterised by energy. I usually commenced by bleeding the patient to approaching syncope, after which I subjected him to a warm shower bath; then an antimonial emetic was administered, which was followed by a free cathartic of calomel and jalap, or salts and senna, or some other medicine equally active—always taking care to make calomel one of the ingredients. After a free action of the bowels was effected, a solution of tartar emetic was given every few hours, for the purpose either of keeping the patient nauseated, or with the more useful intention of commanding the circulation, and keeping up an action of the skin. When there was much fever, a repetition of the warm shower was directed every few hours, which was among the very best means used for reducing the morbid heat. When these means did not sufficiently control the febrile action, I had recourse again to the lancet, with mercurial and other purgatives, which were given daily. Indeed, at the commencement of this affection, my inclination and opinion led me to a free use of mercury; but as I advanced in the treatment, I became satisfied that salivation had no beneficial influence, and, indeed, that there did not seem to be any advantage in the exhibition of calomel after the proper

action of the abdominal viscera was restored. As there was no ulceration of the fauces, *but a deeply injected condition only*, no gargles were directed but those of a mild character.

To the throat externally, no applications were made, but volatile liniment and emollient poultices. I had long had an abhorrence of blistering in scarlatina, in any form, as I had mostly seen cases where this remedy was used prove fatal, and often, as I thought, from the ill-conditioned state of the blistered surfaces; this was, however, particularly the case in young subjects.

When the disease was mild in its character, my course was very different from the one laid down above: in such cases I did little more than give mild doses of epsom salts, or of oil, with a little calomel, which was given at the onset; and afterwards a light diet was directed with laxatives. I have not unfrequently seen what were obviously mild cases of scarlatina become serious, and end fatally, in consequence of the treatment being so active as to destroy the equilibrium of the circulation, and cause a recession from the surface, with consequent congestions of the brain, abdominal viscera, or other organs, which eventually proved fatal. This result I have occasionally seen after bleeding, when there was much congestion of the skin and subjacent cellular membrane.

Cupping on the temples or back of the neck, had a happy effect in some cases, where there was determination to the brain. I recollect one case in which deep coma existed, that was greatly relieved by cupping. Leeching would no doubt have had a very happy effect; but my location in 1833 prevented any trials being made with it. I did not lose a single case of the simple form of the disease; but the reader knows from the foregoing pages that when a complication with erysipelas took place this fortunate result did not always ensue.

In the treatment of the cases in which erysipelatous inflammation of the face and scalp occurred, but one mode of treatment seemed at all successful; and even that too often failed. The first case of this kind that I met with, was that of a young

lady eighteen years of age. She was of a delicate form, and had a feeble constitution. Her disease had progressed some days before I saw her; and about twenty-four hours anterior, an inflamed belt had crossed the nose, and rested on each cheek. This caused alarm in the minds of her friends, that led to a consultation. I found her nearly pulseless, with delirium and subsultus. Cold applications had been used to the inflamed part; and as yet no vesicatiou had taken place, which had probably been prevented by the application of cold water.

The general treatment of this case had been mercurial. Large and repeated doses of calomel had been given, and but little else. Salivation, however, had not supervened. I directed but little to be done, as I saw that death must take place in a few hours.

I was very soon called to another case, which had been managed by the same medical gentleman, and in which the treatment had been similar to that pursued in the above. Calomel had been given largely, notwithstanding the whole face and scalp were involved in the inflammation, which had produced vesication. A tendency to coma and delirium was present. I directed a continuance of the calomel, and applied the mercurial ointment to the vesicated surface. I also wished to bleed the patient, but she would not submit. I gave nauseating doses of antimony, and continued them as long as they could be useful. She however succumbed in a few days.

These cases produced a degree of alarm in my mind, as I felt that in them was a masked form of scarlatina, associated with erysipelas that was calculated to set at defiance the best directed efforts. On mature deliberation, however, I determined on the following course: in the first place, to bleed, in all cases where the patient would bear it, and to repeat it as often as was admissible; in the second place, to purge with calomel and jalap, or senna and salts; and in the third place, to vomit with tartar emetic, either immediately before purging, or within a few hours after. The emetics and cathartics to be repeated according to circumstances; and

throughout, antimonials to be given in less than nauseating doses for the purpose of controlling the circulation; whilst blue ointment and poultice should be applied to the blistered surfaces.

This plan I pursued as long as the powers of the system would permit. At this distance of time, I can find but little to regret in my course, unless it be as regards the use of mercurials; for although I occasionally salivated my patients, I am not of the opinion that I saved a single case by it; and if time and reflection can render the judgment more correct, I can now aver that a treatment independent of mercurials would be equally as safe as the contrary. I believe that bleeding, emetics and purgatives, with the constant and untiring use of antimonials from beginning to end, with proper dressings to the vesicated surfaces, were all that were materially useful. To combine calomel with purgatives was possibly useful, but the specific action of mercury seemed to do no good. So far as regards the influence of antimonials in this affection, in preventing a fatal termination, the following case, I presume, will be instructive.

A young lady was taken with scarlatina anginosa, and when I first saw her the inflammation had travelled up the septum narium, and contrary to its usual course appeared at the upper border of the lip, but was rapidly reaching the ridge of the nose. She was bled, and vomited by tartar, which immediately stopped the progress of the inflammation; and it was kept stationary, and eventually removed by the frequent exhibition of nauseating doses of tartar.

Purging will always be resorted to, in those diseases affecting the mucous membrane of the fauces, mouth and nose, because experience has taught most practitioners, that a depletory course (pursued with care) of the stomach and bowels by cathartics has a most happy effect in subduing inflammatory conditions of those parts; hence it is that purgatives of the hydragogue kind are best; such as jalap, epsom salts, &c. When diarrhœa accompanies any form of scarlatina, danger may be apprehended, and Dover's powder, with calomel or

blue mass, will be proper. If the head be not affected, other means must be resorted to. In the disease under consideration there was scarcely a case of diarrhœa that came under my observation.

In order to give a just idea of the beneficial effects of bleeding, I will give a short history of two cases; as I think, both were happily terminated in consequence of repeated bleedings, I shall omit the recital of other cases that would equally prove the efficacy of the free use of the lancet.

A gentleman aged 45 was taken with the usual symptoms of the disease, but had no medical attendance for some days, and by various imprudences, erysipelas of the face was established in the usual way. The inflammation involved the whole face and scalp; articulation and swallowing were almost impossible for days; blindness also was produced by the swelling; abscesses formed in the upper eye-lids, and a number on various points of the scalp, each of which when opened contained a tea-spoonful of pus. Vesication was very general and the discharge profuse. Accompanying this condition was pain in the head, general fever, and almost constant delirium.

This patient was bled from the arm three times, about 30 ounces of blood being taken each time, which had a most happy effect; each successive venesection moderating the reaction, and abating the head-ache and delirium. To this remedy was added an antimonial emetic, with continued nauseating doses, and cathartics of calomel and jalap, with dressings to the inflamed surfaces of mercurial ointment and poultices. This patient became convalescent in about ten days from the commencement of the erysipelatous inflammation, and finally recovered. I will cite one case more.

Very near the conclusion of the epidemic, a youth, aged sixteen, complained a little in the evenlng, but went to bed in the usual way. He arose in the night, stepped over the *head* of his bed, and fell about 10 feet. The side of his occiput struck the edge of the lowest step of the stairs, lacerating the

soft parts to the bone, and producing a profuse hæmorrhage from the occipital artery.

The patient was instantly thrown into a comatose condition from which he did not recover for five days. During this time I scarcely suspected the presence of any disease other than that produced by the fall; and accordingly treated my patient altogether in a surgical point of light. He was bled twice a day for the first five days; and cathartics and antimonials were administered. The wound was treated in the usual way and cold applications were mostly kept to the scalp.

About the time the comatose condition began to subside, I discovered that erysipelas of the nose was setting in, and I now for the first time found the reason why I had had so much difficulty in controlling the violence of what I had regarded as reaction. This young man had not to suffer the same amount of erysipelatous inflammation that others had, and very soon recovered, having lost about six pounds of blood during the first five days after his fall.

With regard to the treatment pursued in those cases where erysipelatous inflammation of the extremities supervened, but little need be said, as a method was adopted very similar to that pursued in the management of the affections of the head. As a number of cases lingered long, it was a matter of necessity to treat them mildly; and in these cases I tried salivation, but no benefit was derived from it. When suppuration took place the abscesses were opened with the knife, and the wound was dressed in the usual way. Poultices were generally applied to the inflamed parts, and sometimes spirits and water with mercurial ointment.

The pregnant patients were treated actively, particularly as regarded the use of the lancet; for I found that free bleeding relieved pain and of course soothed the last moments of those who sunk beneath the weight of this terrible malady. The single case that recovered was managed without any active treatment. Rest was enjoined, a low diet, and mild purgatives in small doses, with minute portions of tartrate of antimony.

During the prevalence of this disease, I lost in St. Clairsville eight patients by it, and in the country six. The whole number treated by me individually was two hundred, of which one hundred were in town. I saw, however, a considerable number of cases in consultation. I believe that no more than fourteen died in town during the epidemic; all of whom, except one, were adults.

Cincinnati, Oct. 1842.

REVIEWS.

ART. IV.—*Animal Chemistry; or Organic Chemistry in its application to Physiology and Pathology.* By JUSTUS LIEBIG, M. D., Professor of Chemistry in the University of Giessen. Edited from the Author's MS., by William Gregory, M. D., Professor of Chemistry, King's College, Aberdeen. With additions, notes, and corrections, by John W. Webster, M. D., Erving Professor of Chemistry in Harvard University. 1842.

Some one has termed Animal Chemistry the border territory lying between the domains of chemistry and physiology, which has been alternately claimed and occupied by both. Like all other border territories, the limits of which are not well defined, it has formed the theatre for warm and protracted controversies, each party claiming the right of governing it by his own laws. To the chemist, the processes of life have offered nothing more than examples of chemical affinity. In the stomach he has recognised a sort of fermenting vat, and in the lungs a furnace, where fuel is consumed and heat disengaged for warming the body. Some enthusiasts in this profession have not been able to see in all the mysterious functions of living beings any thing higher than a complicated and well arranged chemical laboratory, where composition and resolution, the generation of acids and alkalies, and the development of brain, blood-vessel and nerve go on under the direction of laws which govern the reactions of inorganic matter. The vitalist, on the other hand, has claimed for every action of the living organism the exclusive agency of the vital principle—rejecting all chemical influences as extraneous and hostile—asserting that chemistry and vitality are antagonist principles, each struggling for the ascendency—the vital force prevailing

while the being lives, and only yielding up the body to chemistry when it dies. As in most controversies, truth, we apprehend, will be found to lie between the extremes of these opinions. The theories of the old chemists concerning the functions of vitality, it must be admitted, were visionary and absurd enough; but equally irrational must appear any attempt, at the present day, to solve many of the problems of vitality without a reference to chemistry. For the last twenty-five years physiology has been deriving the most important aid from the researches of the laboratory. Chemistry has improved its principles of research and greatly multiplied its facts, but never before did it receive so rich a contribution from this quarter as in the labors of Professor Liebig, from which we have no doubt a new era will be dated in the advance of physiology. In the work which stands at the head of this article the points of intersection of chemistry with physiology are clearly indicated, and it is shown that these sciences maintain towards each other relations similar to those which exist between chemistry and physics. In no work on animal chemistry has an attempt been made to explain so many vital processes upon chemical principles, and we are perfectly safe in asserting that no work has lately been given to the public, abounding in so many novel and original views, or which has excited in all quarters so startling an interest. When it was in progress it is said to have been submitted by its author to Müller, Tiedmann and Wagner, the three most distinguished physiologists in Germany, and while it is not pretended that they are pledged to the opinions of Professor Liebig, it is stated on high authority that there is but one feeling among them as to the vast importance of chemistry to physiology. We cannot, therefore, help regarding this ancient war as pretty nearly at an end. The physiologist and chemist, as their sciences in many parts are mixed up together, must go hand in hand in the investigation of the phenomena of life, for it is only by their joint labors that we can hope to attain a new physiology and a more rational pathology. Organic chemistry offers to the physiologist a sounding line which, al-

though it is not long enough to measure the depths of the sea he is exploring, is yet the only instrument which can guide him in many of his investigations. The work before us, then, by far the ablest on that subject that has yet appeared, it will readily be believed, is full of interest for the medical man, and with that conviction we have undertaken to give in this article an analysis of its remarkable doctrines.

We will premise, that Dr. Liebig admits the existence of a vital principle, a *vis vitæ*, as distinct from electricity or chemical affinity, which is the source, in animals and vegetables, under the action of external influences, of growth and of reproduction, the subjects to which the first part of his work is devoted.

"We know not," he says, "how a certain something, invisible and imponderable in itself (heat), gives to certain bodies the power of exerting an enormous pressure on surrounding objects; we know not even how this something is produced when we burn wood or coals.

"So it is with the vital force, and with the phenomena exhibited by living bodies. The cause of these phenomena is not chemical force; it is not electricity, nor magnetism; it is a force which has certain properties in common with all causes of motion, and of change in form and structure in all material substances. It is a peculiar force, because it exhibits manifestations which are found in no other known force.

"As in the closed galvanic circuit, in consequence of certain changes which an inorganic body, a metal, undergoes when placed in contact with an acid, a certain something becomes cognizable by our senses, which we call a current of electricity; so, in the animal body, in consequence of transformations and changes undergone by matter previously constituting a part of the organism, certain phenomena of motion and activity are perceived, and these we call life or vitality."

Every motion or manifestation of force, according to our author, is the result of a transformation of the structure or substance of organs; every conception and mental affection is followed by changes in the chemical nature of the secreted fluids, and every thought and every sensation is accompanied by a change in the composition of the substance of the brain. The first conditions of animal life are nutritious matters and

oxygen introduced into the system; and all vital activity arises from the reciprocal action of the oxygen and the elements of the food. At every moment of his life man is taking oxygen into his system from the atmosphere, in a quantity to amount, according to Lavoisier, to 746 lbs., and according to Menzies, to 837 lbs. in one year; and yet, if he has been supplied with sufficient food, we find his weight at the beginning and end of the year, if not quite the same, differing at most by only a few pounds. The question naturally occurs, what has become of the enormous weight of oxygen thus introduced in the course of a year into the human system?

"This question may be answered satisfactorily; no part of this oxygen remains in the system; but it is given out again in the form of a compound of carbon and hydrogen.

"The carbon and hydrogen of certain parts of the body have entered into combination with the oxygen introduced through the lungs and through the skin, and have been given out in the forms of carbonic acid gas and the vapor of water.

"At every moment, with every expiration, certain quantities of its elements separate from the animal organism, after having entered into combination, within the body, with the oxygen of the atmosphere.

"If we assume, with Lavoisier and Séguin, in order to obtain a foundation for our calculation, that an adult may receive into his system daily 32½ oz. (46,037 cubic inches=15,661 grains, French weight) of oxygen, and that the weight of the whole mass of his blood, of which 80 per cent. is water, is 24 lbs.; it then appears, from the known composition of the blood, that, in order to convert the whole of its carbon and hydrogen into carbonic acid and water, 64,103 grains of oxygen are required. This quanntity will be taken into the system of an adult in four days two hours.

"Whether this oxygen enters into combination with the elements of the blood, or with other other parts of the body containing carbon and hydrogen, in either case the conclusion is inevitable, that the body of a man, who daily takes into his system 32½ oz. of oxygen, must receive daily in the shape of nourishment, as much carbon and hydrogen as would suffice to supply 24 lbs. of blood with these elements; it being presupposed that the weight of the body remains unchanged, and that it retains its normal condition as to health."

This supply is furnished in the food, which must always be in a direct ratio to the quantity of oxygen taken into the system. Two animals respiring unequal quantities of oxygen will not require the same amount of nourishment; nor will an animal in a state of rest consume as much food as during exercise or work, the number of respirations in the latter case being greater than in the former. A child, whose respiration is more active than that of the adult, requires food oftener and is less patient of hunger. A bird, deprived of food, will die on the third day, while a reptile with its sluggish respiration will go half a year without food. Health suffers, whether the supply of food in proportion to the oxygen respired, be excessive or deficient. In one case obesity would be the result; and in the other dyspepsia and emaciation.

But the quantity of oxygen inspired is affected not only by the activity of the respiratory function, but also by the temperature and density of the atmosphere. In cold weather, and in cold climates, more air, and consequently more oxygen, enters the chest of a man than is respired by him in summer and in southern latitudes; and it is obvious that in an equal number of respirations we consume more oxygen at the level of the sea than on a mountain. The character and quantity of our food ought to correspond to these differences. In winter and in northern latitudes, more food is necessary, and food richer in carbon, upon which the oxygen acts. Certain savages, exposed almost naked to the severity of an arctic winter, will consume ten pounds of flesh, and "a dozen of tallow candles into the bargain," daily—facts which warmly clad travellers speak of with astonishment.

"Even when we consume equal weights of food in cold and warm countries, infinite wisdom has so arranged, that the articles of food in different climates are most unequal in the proportion of carbon they contain. The fruits on which the natives of the south prefer to feed do not in the fresh state contain more than 12 per cent. of carbon, while the bacon and train oil used by the inhabitants of the arctic regions contain from 66 to 80 per cent. of carbon.

"It is no difficult matter in warm climates, to study mode-

ration in eating, and men can bear hunger for a long time under the equator; but cold and hunger united very soon exhaust the body.

"The mutual action between the elements of the food and the oxygen conveyed by the circulation of the blood to every part of the body is THE SOURCE OF ANIMAL HEAT."

It is well known that all animals possess within themselves a source of heat independent of surrounding objects. Even those animals called cold-blooded, maintain a temperature higher than the medium in which they live.

"This high temperature of the animal body, or, as it may be called, disengagement of heat, is uniformly and under all circumstances the result of the combination of a combustible substance with oxygen.

"In whatever way carbon may combine with oxygen, the act of combination cannot take place without the disengagement of heat. It is a matter of indifference whether the combination take place rapidly or slowly, at a high or at a low temperature; the amount of heat liberated is a constant quantity.

"The carbon of the food, which is converted into carbonic acid within the body, must give out exactly as much heat as if it had been directly burnt in the air or in oxygen gas; the only difference is, that the amount of heat produced is diffused over unequal times. In oxygen, the combustion is more rapid, and the heat more intense; in air it is slower, the temperature is not so high, but it continues longer.

"It is obvious, that the amount of heat liberated must increase or diminish with the quantity of oxygen introduced in equal times by respiration. Those animals which respire frequently, and consequently consume much oxygen, possess a higher temperature than others, which, with a body of equal size to be heated, take into the system less oxygen. The temperature of a child (102°) is higher than that of an adult (99.5°.) That of birds (104° to 105.4°) is higher than that of quadrupeds (98.5° to 100.4°) or than that of fishes or amphibia, whose proper temperature is from 2.7° to 3.6° higher than that of the medium in which they live. All animals, strictly speaking, are warm-blooded; but in those only which possess lungs is the temperature of the body quite independent of the surrounding medium."

The temperature of man is the same in all latitudes; yet the loss of heat at Palermo, where the external temperature

is nearly equal to that of the body, and in the polar regions, where the temperature of the air is from 70° to 90° lower, must be very unequal, and the heat given off under the latter circumstances, must be restored within the body with great rapidity. This restoration is effected by the mutual action of the elements of the food and the inspired oxygen, which can never unite without the evolution of heat.

"In the animal body the food is the fuel; with a proper supply of oxygen we obtain the heat given out during its oxidation or combustion. In winter, when we take exercise in a cold atmosphere, and when consequently the amount of inspired oxygen increases, the necessity for food containing carbon and hydrogen increases in the same ratio; and by gratifying the appetite thus excited, we obtain the most efficient protection against the most piercing cold. A starving man is soon frozen to death: and every one knows that the animals of prey in the arctic regions far exceed in voracity those of the torrid zone.

"In cold and temperate climates, the air, which incessantly strives to consume the body, urges man to laborious efforts in order to furnish the means of resistance to its action, while, in hot climates, the necessity of labor to provide food is far less urgent.

"Our clothing is merely an equivalent for a certain amount of food. The more warmly we are clothed the less urgent becomes the appetite for food, because the loss of heat by cooling, and consequently the amount of heat to be supplied by the food, is diminished."

According to this view of the case, the quantity of food required by the system bears an exact ratio to the number of respirations, to the temperature of the air, and to the amount of heat given off to the surrounding medium. On this point Professor Liebig makes the following very interesting remarks:

"The Englishman in Jamaica sees with regret the disappearance of his appetite, previously a source of frequently recurring enjoyment; and he succeeds by the use of cayenne pepper and the most powerful stimulants, in enabling himself to take as much food as he was accustomed to eat at home. But the whole of the carbon thus introduced into the system is not consumed; the temperature of the air is too high, and the oppressive heat does not allow him to increase the number

of respirations by active exercise, and thus to proportion the waste to the amount of food taken; disease of some kind, therefore, ensues.

"On the other hand, England sends her sick, whose diseased digestive organs have in a greater or less degree lost the power of bringing the food into that state in which it is best adapted for oxidation, and therefore furnish less resistance to the oxidizing agency of the atmosphere than is required in their native climate, to southern regions, where the amount of inspired oxygen is diminished in so great a proportion; and the result, an improvement in the health, is obvious. The diseased organs of digestion have sufficient power to place the diminished amount of food in equilibrium with the inspired oxygen; in the colder climate, the organs of respiration themselves would have been consumed in furnishing the necessary resistance to the action of the atmospheric oxygen.

"In our climate, hepatic diseases, or those arising from excess of carbon, prevail in summer; in winter, pulmonic diseases, or those arising from excess of oxygen, are more frequent."

The practical lesson to be drawn from this doctrine is obvious and impressive. Dr. Liebg has afforded a satisfactory explanation of a fact which observation has fully established, and by which men ought to have been taught long ago to adapt their diet to the circumstances of the climate in which they live.

Carbon has been specially alluded to as the element which, by uniting with oxygen, supports the temperature of the animal body, but we are not to lose sight of the fact, that the hydrogen of the food plays a part not less important than the carbon. The whole process of respiration, Professor Liebig remarks, is most clearly developed by the state of an animal wholly deprived of food.

"The first effect of starvation is the disappearance of fat, and this fat cannot be traced either in the urine or in the scanty fæces. Its carbon and hydrogen have been given off through the skin and lungs in the form of oxidized products; it is obvious that they have served to support respiration.

"In the case of a starving man, 32½ oz. of oxygen enter the system daily, and are given out again in combination with a part of his body. Currie mentions the case of an individual

who was unable to swallow, and whose body lost 100 lbs. in weight during a month; and according to Martell (Trans. Linn. Soc., vol. xi. p. 411,) a fat pig, overwhelmed in a slip of earth, lived 160 days without food, and was found to have diminished in weight, in that time, more than 120 lbs. The whole history of hybernating animals, and the well established facts of the periodical accumulation, in various animals, of fat, which, at other periods, entirely disappears, prove that the oxygen, in the respiratory process, consumes, without exception, all such substances as are capable of entering into combination with it. It combines with whatever is presented to it; and the deficiency of hydrogen is the only reason why carbonic acid is the chief product; for, at the temperature of the body, the affinity of hydrogen for oxygen far surpasses that of carbon for the same element."

"In the progress of starvation, however, it is not only the fat which disappears, but also, by degrees, all such of the solids as are capable of being dissolved. In the wasted bodies of those who have suffered starvation, the muscles are shrunk and unnaturally soft, and have lost their contractility; all those parts of the body which were capable of entering into the state of motion, have served to protect the remainder of the frame from the destructive influence of the atmosphere. Toward the end, the particles of the brain begin to undergo the process of oxidation, and delirium, mania, and death close the scene; that is to say, all resistance to the oxidizing power of the atmospheric oxygen ceases, and the chemical process of eremacausis, or decay, commences, in which every part of the body, the bones excepted, enters into combination with oxygen.

"The time which is required to cause death by starvation depends on the amount of fat in the body, on the degree of exercise, as in labor or exertion of any kind, on the temperature of the air, and finally, on the presence or absence of water. Through the skin and lungs there escapes a certain quantity of water, and as the presence of water is essential to the continuance of the vital motions, its dissipation hastens death. Cases have occurred, in which a full supply of water being accessible to the sufferer, death has not occurred, till after the lapse of twenty days. In one case, life was sustained in this way for the period of sixty days.

"In all chronic diseases death is produced by the same cause, namely, the chemical action of the atmosphere. When those substances are wanting, whose function in the organism is to support the process of respiration; when the diseased

organs are incapable of performing their proper function of producing these substances; when they have lost the power of transforming the food into that shape in which it may, by entering into combination with the oxygen of the air, protect the system from its influence, then, the substance of the organs themselves, the fat of the body, the substance of the muscles, the nerves, and the brain, are unavoidably consumed.*

"The true cause of death in these cases is the respiratory process, that is, the action of the atmosphere."

Professor Liebig next proceeds to examine the theory which ascribes to the nervous system the generation of animal heat. He remarks:

"No one will seriously deny the share which the nervous apparatus has in the respiratory process; for no change of condition can occur in the body without the nerves; they are essential to all vital motions. Under their influence, the viscera produce those compounds, which, while they protect the organism from the action of the oxygen of the atmosphere, give rise to animal heat, and when the nerves cease to perform their functions, the whole process of the action of oxygen must assume another form. When the pons Varolii is cut through in the dog, or when a stunning blow is inflicted on the back of the head, the animal continues to respire for some time, often more rapidly than in the normal state; the frequency of the pulse at first rather increases than diminishes, yet the animal cools as rapidly as if sudden death had occurred. Exactly similar observations have been made on the cutting of the spinal cord, and of the par vagum. The respiratory motions continue for a time, but the oxygen does not meet with those substances with which, in the normal state, it would have combined; because the paralyzed viscera will no longer furnish them. The singular idea that the nerves produce animal heat, has obviously arisen from the notion that the inspired oxygen combines with carbon, in the blood itself; in which case the temperature of the body, in the above experiments, certainly, ought not to have sunk. But, as we shall afterwards see, there cannot be a more erroneous conception than this.

"As by the division of the pneumogastric nerves the motion of the stomach and the secretion of the gastric juice are arrest-

*For an account of what really takes place in this process, I refer to the considerations on the means by which the change of matter is effected in the body of the carnivora, which will be found further on.

ed, and an immediate check is thus given to the process of digestion, so the paralysis of the organs of vital motion in the abdominal viscera affects the process of respiration. These processes are most intimately connected; and every disturbance of the nervous system or of the nerves of digestion reacts visibly on the process of respiration."

Our author proves by the most indisputable calculations, that the heat evolved during the union of oxygen with the elements of the food is quite sufficient to maintain the temperature of the animal body. Why, then, look further for other mysterious sources of caloric?

"According to the experiments of Despretz, 1 oz. of carbon evolves, during its combustion, as much heat as would raise the temperature of 78.15 oz. of water at 32° to 212°, that is, by 180 degrees; in all, therefore, 78.15 times 180°=14067 degrees of heat. Consequently, the 13.9 oz. of carbon which are daily converted into carbonic acid in the body of an adult, evolve 13.9+14067°=195531.3 degrees of heat. This amount of heat is sufficient to raise the temperature of 1 oz. of water by that number of degrees, or from 32° to 195563.3°; or to cause 67.9 lbs. of water at 32° to boil; or to heat 184 3 lbs. of water to 98.3° (the temperature of the human body;) or to convert into vapor 11.4 lbs. of water at 98.3°.

"If we now assume that the quantity of water vaporized through the skin and lungs in 24 hours amounts to 48 oz. (3 lbs.,) then there will remain, after deducting the necessary amount of heat, 144137.7 degrees of heat, which are dissipated by radiation, by heating the expired air, and in the excrementitious matters.

"In this calculation, no account has been taken of the heat evolved by the hydrogen of the food, during its conversion into water by oxidation within the body. But if we consider that the specific heat of the bones, of fat, and of the organs generally, is far less than that of water, and that consequently they require, in order to be heated to 98.3°, much less heat than an equal weight of water, no doubt can be entertained, that when all the concomitant circumstances are included in the calculation, the heat evolved in the process of combustion, to which the food is subjected in the body, is amply sufficient to explain the constant temperature of the body as well as the evaporation from the skin and lungs."

This explanation of the source of animal temperature is not peculiar to Dr. Liebig, but he has presented the doctrine

in the clearest light, and supported it by an array of facts and arguments which appear to us to have settled the question.

On the subject of *reproduction* the author throws out the following hints, which are so curious that we are tempted to quote them:

"In a young animal the waste is less than the increase; and the female retains, up to a certain age, this peculiar condition of a more intense vegetative life. This condition does not cease in the female as in the male, with the complete development of all the organs of the body.

"The female in the lower animals, is, at certain seasons, capable of reproduction of the species. The vegetative life in her organism is rendered more intense by certain external conditions, such as temperature, food, &c.; the organism produces more than is wasted, and the result is the capacity of reproduction.

"In the human species, the female organism is independent of those external causes which increase the intensity of vegetative life. When the organism is fully developed, it is at all times capable of reproduction of the species; and infinite wisdom has given to the female body the power, up to a certain age, of producing all parts of its organization in greater quantity than is required to supply the daily waste.

"This excess of production can be shown to contain all the elements of a new organism; it is constantly accumulating, and is periodically expelled from the body until it is expended in reproduction. This periodical discharge ceases when the ovum has been impregnated, and from this time every drop of the superabundant blood goes to produce an organism like that of the mother.

"Exercise and labor cause a diminution in the quantity of the menstrual discharge; and when it is suppressed in consequence of disease, the vegetative life is manifested in a morbid production of fat. When the equilibrium between the vegetative and nervous life is disturbed in the male, when, as in eunuchs, the intensity of the latter is diminished, the predominance of the former is shown in the same form, in an increased deposit of fat."

The blood supplies the materials for the growth of the system and for repairing its waste. No substance, therefore, can be considered nutritious which is not susceptible of conversion into blood. The two most important ingredients of

the blood, the fibrine and albumen, have very unexpectedly been proved to be identical in composition. They contain the elements out of which the living frrame is built up—nitrogen, phosphorus, sulphur, the earth of bones, sea salt and other salts of soda and potash, carbonic, phosphoric and sulphuric acids. The red globules with fibrine and albumen contain iron as a constant element. Fatty bodies, of a peculiar kind, are also found in the blood, and water forms its largest ingredient.

"Both the albumen and fibrine, in the process of nutrition, are capable of being converted into muscular fibre, and muscular fibre is capable of being reconverted into blood. These facts have long been established by physiologists, and chemistry has merely proved that these metamorphoses can be accomplished under the influence of a certain force, without the aid of a third substance, or of its elements, and without the addition of any foreign element, or the separation of any element previously present in these substances.

"If we now compare the composition of all organized parts with that of fibrine and albumen, the following relations present themselves—

"All parts of the animal body which have a decided shape, which form parts of organs, contain nitrogen. No part of an organ which possesses motion and life, is destitute of nitrogen; all of them contain likewise carbon and the elements of water, the latter, however, in no case in the proportion to form water.

"The chief ingredients of the blood contain nearly 17 per cent. of nitrogen, and no part of an organ contains less than 17 per cent. of nitrogen.

"The most convincing experiments and observations have proved that the animal body is absolutely incapable of producing an elementary body, such as carbon or nitrogen, out of substances which do not contain it; and it obviously follows, that all kinds of food fit for the production either of blood, or of cellular tissue, membranes, skin, hair, muscular fibre, &c., must contain a certain amount of nitrogen, because that element is essential to the composition of the above named organs; because the organs cannot create it from the other elements presented to them; and, finally, because no nitrogen is absorbed from the atmosphere in the vital process.

"The substance of the brain and nerves contains a large quantity of albumen, and, in addition to this, two peculiar

fatty acids, distinguished from other fats by containing phosphorus (phosphoric acid?) One of these contains nitrogen (Frémy)."

In carnivorous animals the process of nutrition is seen in its simplest form. They live upon substances identical with their own flesh and blood, and in a chemical sense it may be said that, in supporting the vital process, they consume themselves. All their food is derived from blood, and being dissolved in the stomach, it is again, in its passage through the system, converted into blood, from which is reproduced all those parts of their organization which have undergone change or metamorphosis.

"The process of nutrition in graminivorous animals appears at first sight altogether different. The digestive organs are less simple, and their food consists of vegetables, the great mass of which contains but little nitrogen.

"From what substances, it may be asked, is the blood formed, by means of which their organs are developed? This question may be answered with certainty.

"Chemical researches have shown, that all such parts of vegetables as can afford nutriment to animals contain certain constituents which are rich in nitrogen; and the most ordinary experience proves that animals require for their support and nutrition less of these parts of plants in proportion as they abound in the nitrogenized constituents. Animals cannot be fed on matters destitute of these nitrogenized constituents.

These important products of vegetation are especially abundant in the seeds of the different kinds of grain, and of pease, beans and lentils; in the roots and the juices of what are commonly called vegetables. They exist, however, in all plants, without exception, and in every part of plants in larger or smaller quantity."

These substances are *vegetable fibrine*, *vegetable albumen*, and *vegetable caseine*, nitrogonized compounds, out of which the blood of the herbivora is formed. Professor Liebig remarks:

"The chemical analysis of these three substances has led to the very interesting result that they contain the same organic elements, united in the same proportion by weight; and, what is still more remarkable, that they are identical in composition with the chief constituents of blood, animal fibrine, and

albumen. They all three dissolve in concentrated muriatic acid with the same deep purple color, and even in their physical characters, animal fibrine and albumen are in no sense different from vegetable fibrine and albumen. It is especially to be noticed, that by the phrase identity of composition, we do not here imply mere similarity, but that even in regard to the presence and relative amount of sulphur, phosphorus, and phosphate of lime, no difference can be observed."

Vegetables, therefore, produce the blood of animals, for the carnivora, in consuming the graminivora, derive only such vegetable principles as had served for their nourishment. The vegetable fibrine and albumen which made the blood of the graminivorous animals, enter into the system of the carnivorous animal to constitute his flesh and blood. The development of the animal organism can only take place by the reception of certain principles identical with the chief ingredients of the blood. The blood it cannot create, but only receives it from substances which contain its chief constituents and gives to it its peculiar form. Out of the blood it produces nervous matter, cellular tissue, muscle, tendon and the various other parts which make up the animal frame, and which vegetables cannot produce.

But, besides these elements of food, rich in nitrogen, which contribute chiefly to the growth of animals, there are found other substances, as sugar, starch, and gum, necessary to the support of the animal system. The herbivorous animals quickly perish unless these compounds be supplied. What is the function performed by them? According to Professor Liebig, they cannot be employed in the production of blood, because the azotized substances of the food contain exactly the amount of carbon required for the formation of fibrine and albumen, and they must, therefore, be expended in the production of animal heat. The young of carnivorous animals find the requisite supply of nitrogenized food in the caseine of the the milk, which, curiously enough, turns out on analysis to be identical with the chief constituents of blood, fibrine and albumen—nay more, to be identical in all its properties with vegetable caseine. The caseine is converted into blood without

the agency of any foreign substance, and the butter and the sugar of milk, containing no nitrogen, and only carbon, hydrogen and oxygen, become fuel for the maintenance of animal heat. The author proceeds:

"In the preceding pages it has been assumed, that the elements of the food are converted by the oxygen absorbed in the lungs into oxidized products; the carbon into carbonic acid, the hydrogen into water, and the nitrogen into a compound containing the same elements as carbonate of ammonia.

"This is only true in appearance; the body, no doubt, after a certain time, acquires its original weight. The amount of carbon, and of the other elements, is not found to be increased —exactly as much carbon, hydrogen, and nitrogen has been given out as was supplied in their food; but nothing is more certain than that the carbon, hydrogen, and nitrogen given out, although equal in amount to what is supplied in that form, do not directly proceed from the food.

"It would be utterly irrational to suppose that the necessity of taking food, or the satisfying the appetite, had no other object than the production of urea, uric acid, carbonic acid, and other excrementitious matters—of substances which the system expels, and consequently applies to no useful purposes in the economy.

"In the adult animal, the food serves to restore the waste of matter; certain parts of its organs have lost the state of vitality, have been expelled from the substance of the organs, and have been metamorphosed into new combinations, which are amorphous and unorganized.

"The food of the carnivora is at once converted into blood; out of the newly-formed blood those parts of organs which have undergone metamorphoses are reproduced. The carbon and nitrogen of the food thus become constituent parts of organs.

"Exactly as much carbon and nitrogen is supplied to the organs by the blood, that is, ultimately, by the food, as they have lost by the transformation attending the exercise of their functions.

"What then, it may be asked, becomes of the new compounds produced by the transformations of the organs, of the muscles, of the membranes and cellular tissue, of the nerves and brain?"

These compounds cannot be employed for the reproduction

of those tissues from which they are derived, and if allowed to accumulate in the veins and lymphatics, they would speedily put a stop to the nutritive process. They are removed by an admirable contrivance thus described by Professor Liebig:

"The venous blood, before reaching the heart, is made to pass through the liver; the arterial blood, on the other hand, passes through the kidneys; and these organs separate from both all substances incapable of contributing to nutrition.

"Those new compounds wich contain the nitrogen of the transformed organs are collected in the urinary bladder, and being utterly incapable of any further application in the system, are expelled from the body.

"Those, again, which contain the carbon of the transformed tissues, are collected in the gall-bladder in the form of a compound of soda, *the bile*, which is miscible with water in every proportion, and which, passing into the duodenum, mixes with chyme. All those parts of the bile which, during the digestive process, do not lose their solubility, return during that process into the circulation in a state of extreme division. The soda of the bile, and those highly carbonized portions which are not precipitated by a weak acid (together making 99-100ths of the solid contents of the bile), retain the capacity of resorption by the small and large intestines; nay, this capacity has been directly proved by the administration of enemata containing bile, the whole of the bile disappearing with the injected fluid in the rectum.

"Thus we know with certainty, that the nitrogenized compounds, produced by the metamorphosis of organized tissues, after being separated from the arterial blood by means of the kidneys, are expelled from the body as utterly incapable of further alteration; while the compounds rich in carbon, derived from the same source, return into the system of carnivorous animals.

"The food of the carnivora is identical with the chief constituents of their bodies, and hence the metamorphoses which their organs undergo must be the same as those which, under the influence of the vital force, take place in the matters which constitute their food.

"The flesh and blood consumed as food yield their carbon for the support af the respiratory process, while its nitrogen appears as uric acid, ammonia, or urea. But previously to these final changes, the dead flesh and blood become living flesh and blood, and it is, strictly speaking, the carbon of the

compounds formed in the metamorphoses of living tissues that serves for the production of animal heat.

"The food of the carnivora is converted into blood, which is destined for the reproduction of organized tissues; and by means of the circulation a current of oxygen is conveyed to every part of the body. The globules of the blood, which in themselves can be shown to take no share in the nutritive process, serve to transport this oxygen, which they give up in their passage through the capillary vessels. Here the current of oxygen meets with the compounds produced by the transformation of the tissues, and combines with their carbon to form carbonic acid, with their hydrogen to form water. Every portion of these substances which escapes this process of oxidation is sent back into the circulation in the form of the bile, which by degrees completely disappears.

"In the carnivora the bile contains the carbon of the metamorphosed tissues; this carbon disappears in the animal body, and the bile likewise disappears in the vital process. Its carbon and hydrogen are given out through the skin and lungs as carbonic acid and water; and hence it is obvious that the elements of the bile serve for respiration and for the production of animal heat. Every part of the food of carnivorous animals is capable of forming blood; their excrements, excluding the urine, contain only inorganic substances, such as phosphate of lime; and the small quantity of organic matter which is found mixed with these is derived from excretions, the use of which is to promote their passage through the intestines, such as mucus. These excrements contain no bile and no soda: for water extracts from them no trace of any substance resembling bile, yet bile is very soluble in water, and mixes with it in every proportion.

"Physiologists can entertain no doubt as to the origin of the constituent parts of the urine and of the bile. When, from deprivation of food, the stomach contracts itself so as to resemble a portion of intestine, the gall-bladder, for want of the motion which the full stomach gives to it, cannot pour out the bile it contains; hence in animals starved to death, we find the gall-bladder distended and full. The secretion of bile and of urine goes on during the winter sleep of hybernating animals; and we know that the urine of dogs, fed for three weeks, exclusively on pure sugar, contains as much of the most highly nitrogenized constituent, urea, as in the normal condition."

Professor Liebig rejects the idea that the bile is intended

merely to be excreted. The following are his observations on this subject:

"Were the bile intended merely for excretion, we should find it more or less altered, and also the soda it contains, in the solid excrements. But, with the exception of common salt and of sulphate of soda, which occur in all the animal fluids, only mere traces of soda are to be found in the fæces. The soda of the bile, therefore, at all events, must have returned from the intestinal canal into the organism, and the same must be true of the organic matters which were in combination with it.

"According to the observations of physiologists, a man secretes daily from 17 to 24 oz. of bile; a large dog, 36 oz.; a horse 37 lbs. (Burdach's Physiologie, V. p. 260.) But the fæces of a man do not on an average weigh more than 5½ oz.; and those of a horse 28½ lbs., of which 21 lbs. are water, and 7½ lbs. dry fæces. (Boussingault.) The latter yield to alcohol only 1-20th part of their weight of soluble matter.

"If we assume the bile to contain 90 per cent. of water, a horse secretes daily 592 oz. of bile, containing 59.2 oz. of solid matter, while 7½ lbs. or 120 oz. of dried excrement yield only 6 oz. of matter soluble in alcohol, which might possibly be bile. But this matter is not bile; when the alcohol is dissipated by evaporation, there remains a soft, unctuous mass, altogether insoluble in water, and which, when incinerated, leaves no alkaline ashes, no soda.

During the digestive process, therefore, the soda of the bile, and, along with it, all the soluble parts of that fluid, are returned into the circulation. This soda reappears in the newly formed blood, and, finally, we find it in the urine in the form of phosphate, carbonate, and hippurate of soda. Berzelius found in 1000 parts of fresh human fæces only 9 parts of a substance similar to bile; 5 ounces, therefore, would contain only 21 grains of dried bile, equivalent to 210 grains of fresh bile. But a man secretes daily from 9,640 to 11,520 grains of fluid bile, that is, from 45 to 56 times as much as can be detected in the matters discharged by the intestinal canal."

And the results at which he arrives are thus stated:

"It cannot be disputed, that in an adult carnivorous animal, which neither gains nor loses weight perceptibly from day to day, its nourishment, the waste of organized tissue, and its consumption of oxygen, stand to each other in a well-defined and fixed relation.

"The carbon of the carbonic acid given off, with that of the urine; the nitrogen of the urine, and the hydrogen given off as ammonia and water; these elements, taken together, must be exactly equal in weight to the carbon, nitrogen, and hydrogen of the metamorphosed tissues; and since these last are exactly replaced by the food, to the carbon, nitrogen, and hydrogen of the food. Were this not the case, the weight of the animal could not possibly remain unchanged."

The fact has been alluded to that herbivorous animals consume matters containing no nitrogen, and destined for other purposes than the production of blood. In this class of animals the metamorphosis of existing tissues goes on much less rapidly than in the carnivora, and hence the necessity for materials of aliment which afford to their systems the elements for uniting with oxygen. Were the metamorphosis as rapid as in the systems of carnivorous animals, pastures a thousand times more luxuriant than the existing ones would scarcely suffice for their nourishment; and in that case sugar, gum, and starch would no longer be necessary to their sustenance, because the products of the waste of the organized tissues would contain enough carbon to support the respiratory function.

"Man, when confined to animal food, requires for his support and nourishment extensive sources of food, even more widely extended than the lion and tiger, because, when he has the opportunity, he kills without eating.

A nation of hunters, on a limited space, is utterly incapable of increasing in its numbers beyond a certain point, which is soon attained. The carbon necessary for respiration must be obtained from the animals, of which only a limited number can live on the space supposed. These animals collect from plants the constituents of their organs and of their blood, and yield them, in turn, to the savages who live by the chase alone. They, again, receive this food unaccompanied by those compounds, destitute of nitrogen, which, during the life of the animals, served to support the respiratory process. In such men, confined to an animal diet, it is the carbon of the flesh and of the blood which must take the place of starch and sugar.

"But 15 lbs. of flesh contain not more carbon than 4 lbs. of starch, and while the savage with one animal and an equal

weight of starch could maintain life and health for a certain number of days, he would be compelled, if confined to flesh, in order to procure the carbon necessary for respiration, during the same time, to consume five such animals.

"It is easy to see, from these considerations, how close the connection is between agriculture and the multiplication of the human species. The cultivation of our crops has ultimately no other object than the production of a maximum of those substances which are adapted for assimilation and respiration, in the smallest possible space. Grain and other nutritious vegetables yield us, not only in starch, sugar, and gum, the carbon which protects our organs from the action of oxygen, and produces in the organism the heat which is essential to life, but is also in the form of vegetable fibrine, albumen, and caseine, our blood, from which the other parts of our body are developed.

"Man, when confined to animal food, respires, like the carnivora, at the expense of the matters produced by the metamorphosis of organized tissues; and, just as the lion, tiger, hyæna, in the cages of a menagerie, are compelled to accelerate the waste of the organized tissues by incessant motion, in order to furnish the matter necessary for respiration, so, the savage, for the very same object is forced to make the most laborious exertions and go through a vast amount of muscular exercise. He is compelled to consume force merely in order to supply matter for respiration."

The metamorphosis of tissues appears in the urine, which shows the waste in the carnivora to be much greater than in the graminivora. It is a novel thought of our author, that the phosphoric acid thus resulting goes to the production of brain in this latter class of animals. His words are,

"In the graminivora, therefore, whose food contains so small a proportion of phosphorus or of phosphates, the organism collects all the soluble phosphates produced by the metamorphosis of tissues, and employs them for the development of the bones and of the phosphorized constituents of the brain; the organs of excretion do not separate these salts from the blood. The phosphoric acid which, by the change of matter, is separated in the uncombined state, is not expelled from the body as phosphate of soda; but we find it in the solid excrements in the form of insoluble earthy phosphates."

In this class of animals the intensity of vegetative life far exceeds that of the carnivora. The cat will eat the first

mouse presented to her, and perhaps the second, but even if she kills a third, she does not devour it. The cow and the horse eat almost without interruption from morning till night, and their systems convert into organized tissues all the food they consume, beyond the quantity required for merely supplying the waste of their bodies. They grow fleshy and plump, while the flesh of the carnivorous animal is always tough and sinewy. In wild animals of the herbivorous class, owing to the great exercise they take, oxygen enough is absorbed by respiration to consume the carbon of the gum, sugar and starch, and they remain comparatively lean. With our domestic animals the case is far different.

"The stall-fed animal eats, and reposes merely for digestion. It devours in the shape of nitrogenized compounds far more food than is required for reproduction, or the supply of waste alone; and at the same time it eats far more of substances devoid of nitrogen than is necessary merely to support respiration and to keep up animal heat. Want of exercise and diminished cooling are equivalent to a deficient supply of oxygen; for when these circumstances occur, the animal absorbs much less oxygen than is required to convert into carbonic acid the carbon of the substances destined for respiration. Only a small part of the excess of carbon thus occasioned is expelled from the body in the horse and ox, in the form of hippuric acid; and all the remainder is employed in the production of a substance, which, in the normal state, only occurs in small quantity as a constituent of the nerves and brain. This substance is *fat*."

Now, it is a most curious fact, as stated by Prof. Liebig, that if we compare the composition of sugar and starch with that of mutton and beef suet and of human fat, we find that in all of them the proportion of carbon to hydrogen is the same, and that they only differ in that of oxygen, so that sugar, starch and gum, by the mere separation of a part of their oxygen, may pass into fat. The herbs consumed by the cow contain no butter, and no lard can be found in the corn and potatoes on which hogs are fatted, but these deposits are created in the organism of the animals, and, if the views of Prof. L. be correct, by the separation of oxygen from the elements with which it is combined in the food of the animals.

"Since the carbon of the fatty constituents of the animal body is derived from the food, seeing that there is no other source whence it can be derived, it is obvious if we suppose fat to be formed from albumen, fibrine, or caseine, that, for every 120 equivalents of carbon deposited as fat, 26 equivalents of oxygen must be separated from the elements of these substances; and further, if we conceive fat to be formed from starch, sugar, or sugar of milk, that for the same amount of carbon there must be separated 90, 100, and 110 equivalents of oxygen from these compounds respectively.

"There is, therefore, but one way in which the formation of fat in the animal body is possible, and this is absolutely the same in which its formation in plants takes place; it is a separation of oxygen from the elements of the food."

But this oxygen is not given out in the free state, because it meets in the organism with substances possessing the property of entering into combination with it. A remarkable connection is thus shown to exist between the formation of fat and the respiratory apparatus.

"The abnormal condition, which causes the deposit of fat in the animal body, depends, as was formerly stated, on the disproportion between the quantity of carbon in the food and that of oxygen absorbed by the skin and lungs. In the normal condition, the quantity of carbon given out is exactly equal to that which is taken in the food, and the body acquires no increase of weight from the accumulation of substances containing much carbon and no nitrogen.

"If we increase the supply of highly carbonized food, then the normal state can only be preserved on the condition that, by exercise and labor the waste of the body is increased, and the supply of oxygen augmented in the same proportion.

"The production of fat is always a consequence of a deficient supply of oxygen, for oxygen is absolutely indispensable for the dissipation of the excess of carbon in the food. This excess of carbon deposited in the form of fat, is never seen in the Bedouin or in the Arab of the desert, who exhibits with pride to the traveller, his lean, muscular, sinewy limbs, altogether free from fat; but in prisons and jails it appears as a puffiness in the inmates, fed, as they are, on a poor and scanty diet; it appears in the sedentary females of oriental countries; and finally, it is produced under the well-known condition of the fattening of domestic animals.

"The formation of fat depends on a deficiency of oxygen; but

inthis process, in the formation of fat itself, there is opened up a new source of oxygen, a new cause of animal heat.

"The oxygen set free in the formation of fat is given out in combination with carbon or hydrogen; and whether this carbon and hydrogen proceed from the substance that yields the oxygen, or from other compounds, still there must have been generated by this formation of carbonic acid or water, as much heat as if an equal weight of carbon or hydrogen had been burned in air or in oxygen gas."

Professor Liebig shows by calculation, that every pound of carbon which obtains the oxygen nececsary to convert it into carbonic acid from substances which thereby pass into fat, must disengage as much heat as would raise the temperature of 200° lbs. of water by 70°—that is from 32° to 102°.

"Thus, in the formation of fat, the vital force possesses a means of counteracting a deficiency in the supply of oxygen, and consequently in that of the heat indispensable for the vital process."

"In some diseases, the starch, sugar, &c. of the food obviously do not undergo the changes which enable them to assist in respiration, and consequently to be converted into fat. Thus, in diabetes mellitus, the starch is only converted into grape sugar, which is expelled from the body without further change.

"In other diseases, as for example in inflammation of the liver, we find the blood loaded with fat and oil; and in the composition of the bile there is nothing at all inconsistent with the supposition that some of its constituents may be transformed into fat."

All aliments for man, according to our author, may be divided into two classes—*nitrogenized* and *non-nitrogenized*—the former, capable of conversion into blood, and called *the plastic elements of nutrition*, the latter incapable of this transformation, and which may be styled *elements of respiration*. Among the former he reckons vegetable fibrine, albumen, and caseine, and animal flesh and blood; and among the latter, fat, starch, gum, grape sugar, cane sugar, sugar of milk, pectine, bassorine, wine, beer, and spirits. The nitrogenized materials of food are identical in composition with the constituents of blood, and no nitrogenized substance the composition

of which differs from that of fibrine, albumen and caseine is capable of supporting the vital process in animals. The blood, as has been remarked, must be supplied to them ready formed, and then their organism is prepared to form membranes, nerves, cartilages and the organic part of bones. But a question is suggested here as to the agency of gelatine in nutrition. It is not susceptible of conversion into blood, and it is known that dogs fed exclusively upon it starve, yet the gelatine of bones devoured by them entirely disappears. The same is true of the gelatine of the soup eaten by man, not a particle of which can be detected in any of his excretions. What becomes of it? The author thinks the opinion worthy of investigation, that it is again converted in the body into cellular tissue, membrane and cartilage, and may serve for the reproduction of such parts of these tissues as have been wasted, and for their growth. In the sick man, he remarks, the intensity of the vital force must be diminished, as well in the stomach, as in all other parts of the body. In this condition, it is well known that gelatinous matters, in a dissolved state exercise a beneficial influence on the state of the health. Given in a form adapted for assimilation, they serve to husband the vital force, just as may be done, in the case of the stomach, by due preparation of the food in general. And as the animal organism finds it difficult, if not impossible, to convert gelatine into blood, so the tissues chiefly composed of it, as the skin, cartilages, and membranes, yield slowly to the causes which effect rapid transformations in other parts of the system. While the fat in the body of a sick or starving man quickly disappears, and his muscular tissue is converted once more into blood, the tendons and membranes are but slightly diminished in size or altered in condition.

In part II, Professor Liebig treats of what he terms the *metamorphosis of the tissues*, under which head we find his theory of *digestion*. Albumen, fibrine and caseine, we have seen, are the elements out of which blood, and the other parts of the animal organism are formed, and these products of vegetable life, as has been shown, are identical in composition.

When exposed to a high temperature in a solution of caustic potash, they are decomposed, and by the action of acetic acid a precipitate is thrown down of the same precise character from each of these substances, which, on careful analysis, is found to contain the same organic elements, in exactly the same proportion, as the animal matters from which it is prepared. This product Mulder, to whom we owe the discovery of it, named *proteine*—the commencement and starting point of the animal tissues. The blood, or the constituents of the blood, appear to be compounds of this proteine with variable proportions of inorganic substances. Vegetables produce compounds of proteine, and out of these compounds the various parts of the animal body are developed by the vital force, with the aid of the oxygen of the atmosphere and of the elements of water.

"This proposition must be received as an undeniable truth, when we reflect on the development of the young animal in the egg of a fowl. The egg can be shown to contain no other nitrogenised compound except albumen. The albumen of the yolk is identical with that of the white; the yolk contains, besides, only a yellow fat, in which cholesterine and iron may be detected. Yet we see, in the process of incubation, during which no food and no foreign matter, except the oxygen of the air, is introduced, or can take part in the development of the animal, that out of the albumen, feathers, claws, globules of the blood, fibrine, membrane and cellular tissue, arteries and veins, are produced. The fat of the yolk may have contributed, to a certain extent, to the formation of the nerves and brain; but the carbon of this fat cannot have been employed to produce the organized tissues in which vitality resides, because the albumen of the white and of the yolk already contains, for the quantity of nitrogen present, exactly the proportion of carbon required for the formation of these tissues.

"The true starting-point for all the tissues is, consequently, albumen; all nitrogenized articles of food, whether derived from the animal or from the vegetable kingdom, are converted into albumen before they can take part in the process of nutrition."

Digestion, according to the author, is a chemical action similar to those processes of decomposition or transformation,

known as putrefaction, fermentation, or decay, which latter he expresses by the word *eremacausis.* But it must be borne in mind that these chemical changes are not necessarily attended by the more striking phenomena of putrefaction and fermentation—there is not always present an offensive smell, nor is there of necessity any disengagment of gases. Starch is converted into sugar by the action of sulphuric acid without any escape of gas; fibrine and hard-boiled white of an egg are transformed into liquids, by organic acids, or weak alkaline solutions, without the slightest change of properties except the solid form; and so there are numberless cases in which a complete chemical metamorphosis occurs without the smallest disengagement of gaseous matter. Expressed in the simplest form Professor Liebig remarks:

"Fermentation, or putrefaction, may be described as a process of transformation—that is, a new arrangement of the elementary particles, of a compound, yielding two or more new groups or compounds, and caused by contact with other substances, the elementary particles of which are themselves in a state of transformation or decomposition. It is a communication, or an imparting of a state of motion, which the atoms of a body in a state of motion are capable of producing in other bodies, whose elementary particles are held together only by a feeble attraction.

"Thus the clear gastric juice contains a substance in a state of transformation, by the contact of which with those constituents of the food which, by themselves, are insoluble in water, the latter acquire, in virtue of a new grouping of their atoms, the property of dissolving in that fluid. During digestion, the gastric juice, when separated, is found to contain a free mineral acid, the presence of which checks all further change. That the food is rendered soluble quite independently of the vitality of the digestive organs has been proved by a number of the most beautiful experiments. Food, enclosed in perforated metallic tubes, so that it could not come into contact with the stomach, was found to disappear as rapidly, and to be as perfectly digested, as if the covering had been absent; and fresh gastric juice, out of the body, when boiled white of egg, or muscular fibre, were kept in contact with it for a time at the temperature of the body, caused these substances to lose the solid form and to dissolve in the liquid."

"In the action of the gastric juice on the food, no other ele-

ment takes a share, except the oxygen of the atmosphere and the elements of water. This oxygen is introduced directly into the stomach. During the mastication of the food, there is secreted into the mouth from organs specially destined to this function, a fluid, the saliva, which possesses the remarkable property of enclosing air in the shape of froth, in a far higher degree than even soapsuds. This air, by means of the saliva, reaches the stomach with the food, and there its oxygen enters into combination, while its nitrogen is given out through the skin and lungs. The longer digestion continues, that is, the greater resistance offered to the solvent action by the food, the more saliva, and consequently the more air enters the stomach. Rumination, in certain graminivorous animals, has plainly for one object a renewed and repeated introduction of oxygen; for a more minute mechanical division of the food only shortens the time required for solution."

The gastric juice is a product of the transformation of the stomach itself, and as yeast, which is nothing but vegetable fibrine, albumen or caseine in a state of decomposition, converts sugar into alcohol and carbonic acid; or as muscular fibre, when separated from the body, decomposes the peroxide of hydrogen, by virtue of the state of decomposition in which it is, so the gastric juice, the result of transformation imparts to the food a tendency to change—the insoluble matters become soluble, or are digested in consequence of an impulse which the gastric juice imparts. This is Professor Liebig's theory of digestion, and it is certainly at the same time a most simple and ingenious one.

And equally simple, according to this view, are the other transformations which take place in the system. Thus proteine passes into chondrine (the substance of the cartilages of the ribs,) by combining with the elements of water and oxygen; while in the formation of the serous membranes, nitrogen also has entered into combination. In horn, hair, &c., to the proteine, nitrogen and hydrogen are added in proportions to form ammonia. All the tissues of the body contain, for the same amount of carbon, more oxygen than the constituents of the blood, and hence during their formation oxygen, either from the atmosphere, or from the elements of water, must be

added to the elements of proteine. These conclusions are followed by others still more curious.

"If it be true, that all parts of the body are formed and developed from the blood or the constituents of the blood, that the existing organs at every moment of life are transformed into new compounds under the influence of the oxygen introduced in the blood, then the animal secretions must of necessity contain the products of the metamorphosis of the tissues.

"If it be further true, that the urine contains those products of metamorphosis which contain the most nitrogen, and the bile those which are richest in carbon, from all the tissues which in the vital process have been transformed into unorganized compounds, it is clear that the elements of the bile and of the urine, added together, must be equal, in the relative proportion of these elements to the composition of the blood.

"The organs are formed from the blood, and contain the elements of the blood; they become transformed into new compounds, with the addition only of oxygen and water. Hence the relative proportion of carbon and nitrogen must be the same as in blood.

"If then we subtract from the composition of blood the elements of the urine, then the remainder, deducting the oxygen and water which have been added, must give the composition of the bile.

"Or if from the elements of the blood, we subtract the elements of the bile, the remainder must give the composition of urate of ammonia, or of urea and carbonic acid."

The transformed muscular fibre is to be looked for in the bile and urine, and is found, according to our author, in the urea of the latter and the choleic acid of the former. Urea degenerates into uric acid when the supply of oxygen is deficient, and it is a very remarkable fact that urinary calculi in the human subject vary with the amount of exercise taken by the individual, and consequently with the quantity of oxygen consumed. The calculi of oxalate of lime, or urate of ammonia are formed in persons in whom, from want of exercise, the supply of oxygen has been diminished. The calculi of patients who have resided in cities are succeeded by deposits containing more oxygen, when they go to the country; and

finally when the person regains entire health the highest degree of oxidation takes place, and only carbonic acid and urea are formed in the kidneys.

The bile is a highly important product of the animal system, and the view which Professor Liebig takes of it, if it should be established by future researches, will enhance its interest. That element of the bile which contains the compounds resulting from the transformation of proteine, is choleic acid. In the carnivora it comes from the metamorphosed tissues; but not so in herbivorous animals. In them, other substances besides compounds of proteine must take part in the formation of bile, because the metamorphosis of tissues is not sufficient to account for the large quantity of this secretion formed. These substances, our author supposes, are sugar, starch, &c., which, uniting with the nitrogenized elements of food, supply the blood with the materials for forming it in such abundance—amounting, in the ox, to 37 lbs. a day. If starch be the chief ingredient, it happens by separating a quantity of oxygen, as when starch passes into fat. Starch can become bile in no other way; but the separation being admitted, its conversion into a compound intermediate between starch and fat offers no difficulty. Thus, Professor Liebig sums up:

"The transformation of the compounds of proteine present in the body is effected by means of the oxygen conveyed by the arterial blood, and if the elements of starch, rendered soluble in the stomach, and thus carried to every part, enter into the newly formed compounds, we have the chief constituents of the animal secretions and execretions; carbonic acid, the excretion of the lungs, urea and carbonate of ammonia, excreted by the kidneys, and choleic acid, secreted by the liver."

The remarks of the author on tea and coffee will be found to possess all the novelty which characterizes the views just presented. He says:

"We shall never, certainly, be able to discover how men were led to the use of the hot infusion of the leaves of a certain shrub (tea) or of a decoction of certain roasted seeds

(coffee.) Some cause there must be, which would explain how the practice has become a necessary of life to whole nations. But it is surely still more remarkable, that the beneficial effects of both plants on the health must be ascribed to one and the same substance, the presence of which in two vegetables, belonging to different natural families, and the produce of different quarters of the globe, could hardly have presented itself to the boldest imagination. Yet recent researches have shown in such a manner as to exclude all doubt, that caffeine, the peculiar principle of coffee, and theine, that of tea, are, in all respects, identical.

"It is not less worthy of notice, that the American Indian, living entirely on flesh, discovered for himself, in tobacco smoke, a means of retarding the change of matter in the tissues of his body, and thereby of making hunger more endurable; and that he cannot withstand the action of brandy, which acting as an element of respiration, puts a stop to the change of matter by performing the function which properly belongs to the products of the metamorphosed tissues. Tea and coffee were originally met with among nations whose diet is chiefly vegetable.

"Without entering minutely into the medicinal action of caffeine (theine,) it will surely appear a most striking fact, even if we were to deny its influence on the process of secretion, that this substance, with the addition of oxygen and the elements of water, can yield taurine, the nitrogenized compound peculiar to bile."

According to this view, *caffeine* may be considered *food for the liver*, supplying that organ with the elements necessary for the performance of its function. The author assuredly threads such mazes with a firm and confident step. No difficulties intimidate him. Now that we know the active principle upon which the virtues of opium, bark, &c., depend, "it would argue," he says, "only want of sense to consider the action of these substances inexplicable," and he marches up to the solution of their modus operandi in the following style:

"With respect to the action of the other nitrogenized vegetable principles, such as quinine, or the alkaloids of opium, &c., which manifests itself not in the processes of secretion, but in the phenomena of another kind, physiologists and pathologists entertain no doubt that it is exerted chiefly on the brain and nerves. This action is commonly said to be dyna-

mic—that is, it accelerates, or retards, or alters in some way the phenomena of motion in animal life. If we reflect that this action is exerted by substances which are material, tangible and ponderable; that they disappear in the organism; that a double dose acts more powerfully than a single one; that, after a time, a fresh dose must be given, if we wish to produce the action a second time; all these considerations, viewed chemically, permit only one form of explanation; the supposition, namely that these compounds, by means of their elements, take a share in the formation of new, or the transformation of existing brain and nervous matter.

"Indeed, it cannot be considered merely accidental, that the composition of the most active remedies, namely, the vegetable alkaloids, cannot be shown to be related to that of any constituent of the body, except only the substance of the nerves and brain. All of these contain a certain quantity of nitrogen, and, in regard to their composition, they are intermediate between the compounds of proteine and the fats."

The action of certain other medicinal agents on the system is presented by the author in a novel point of view. It is known that many substances in very minute doses produce the most serious effects, and some of these, according to his views, effectuate the change by being themselves in a state of change. They originate an action which extends through the body, at the same time that their elements take no direct share in the changes which ensue. Their action on the blood is analogous to that of yeast on saccharine liquids, which is simply that of originating motion—of starting the fermentation. In this class, we find several poisons, of which we have perhaps an example in that which renders wounds in the dissecting room so dangerous. The sausage poison of Wurtemburg is considered a striking example. This poison is said to prove invariably fatal, and yet no poisonous substance can be detected in the sausages. They are in a state of fermentation, according to this theory, which the stomach fails to arrest, and which being communicated to the blood, spreads until every part capable of solution has been destroyed. By boiling, the poisonous sausage may be rendered wholesome. It is an interesting suggestion that miasms and contagions act upon the same principle—that they are organic matter, in a state of

transformation which, introduced into the living body, act as a ferment, originating changes which extend throughout the system. But we have not space to enlarge upon it.

The third part of this work treats of the recondite laws of the phenomena of motion in the animal organism. It is principally of a speculative character, but some of the speculations are so interesting that we should like to lay them before our readers; the most that we can do, however, is to present a few of the author's deductions, which we do in his own words:

"For every portion of oxygen which enters into combination in the body, a corresponding portion of heat must be generated.

"The sum of force available for mechanical purposes must be equal to the sum of the vital forces of all tissues adapted to the change of matter.

"If, in equal times, unequal quantities of oxygen are consumed, the result is obvious, in an unequal amount of heat liberated, and of mechanical force.

"When unequal amounts of mechanical force are expended, this determines the absorption of corresponding and unequal quantities of oxygen.

"For the conversion of living tissues into lifeless compounds, and for the combination of oxygen with such constituents of the body as have an affinity for it, *time is required.*

"In a given time, only a limited amount of mechanical force can be manifested, and only a limited amount of heat can be liberated.

"That which is expended, in mechanical effects, in the shape of velocity, is lost in time; that is to say, the more rapid motions are, the sooner or the more quickly is the force exhausted.

"The sum of the mechanical force produced in a given time is equal to the sum of force necessary, during the same time, to produce the voluntary and involuntary motions; that is, all the force which the heart, intestines, &c., require for their motions is lost to the voluntary motions.

"The amount of azotized food necessary to restore the equilibrium between waste and supply, is directly proportional to the amount of tissues metamorphosed.

"The amount of living matter, which in the body loses the condition of life, is, in equal temperatures, directly proportional to the mechanical effects produced in a given time.

"The amount of tissue metamorphosed in a given time, may be measured by the quantity of nitrogen in the urine.

"The sum of the mechanical effects produced in two individuals, in the same temperature, is proportional to the amount of nitrogen in their urine; whether the mechanical force has been employed in voluntary or involuntary motions, whether it has been consumed by the limbs, or by the heart and other viscera.

"That condition of the body which is called *health*, includes the conception of an equilibrium among all the causes of waste and of supply; and thus animal life is recognized as the mutual action of both; and appears as an alternating destruction and restoration of the state of equilibrium.

"In regard to its absolute amount, the waste and supply of matter is, in the different periods of life, unequal; but, in the state of health, the available vital force must always be considered as a constant quantity, corresponding to the sum of living particles.

"Growth, or the increase of mass, stands, at every age, in a fixed relation to the amount of vital force consumed as moving power.

"The vital force, which is expended for mechanical purposes, is subtracted from the sum of the force available for the purpose of increase of mass.

"The active force, which is consumed in the body in overcoming resistance (in causing increase of mass,) cannot, at the same time, be employed to produce mechanical effects.

"Hence it follows necessarily, that when, as in childhood, the supply exceeds the waste of matter, the mechanical effects produced must be less in the same proportion.

"With the increase of mechanical effects produced, the capacity of increase of mass, or of the supply of waste in living tissues, must diminish in the same proportion.

"A perfect balance between the consumption of vital force for supply of matter and that for mechanical effects, occurs, therefore, only in the adult state. It is at once recognized in the complete supply of the matter consumed. In old age more is wasted; in childhood more is supplied than wasted.

"The force available for mechanical purposes in an adult man is reckoned, in mechanics, equal to 1-5th of his own weight, which he can move during eight hours, with a velocity of five feet in two seconds.

"If the weight of a man be 150 lbs., his force is equal to a weight of 30 lbs. carried by him to a distance of 72,000 feet. For every second his momentum of force is $= 30+2.5 = 75$

lbs.; and for the whole day's work, his momentum of motion is $= 30 \times 72{,}000 = 2{,}160{,}000$.

"By the restoration of the original weight of his body, the man collects again a sum of force which allows him, next day, to produce, without exhaustion, the same amount of mechanical effects.

"*This supply of force is furnished in a seven hours' sleep.*"

Dr. Liebig's *theory of disease*, to which the last section of his book, but one, is devoted, is but little more than a speculation—another of the innumerable forms under which the human intellect has viewed a subject still veiled in obscurity. Some notion may be formed of his manner of treating this subject by the following extracts, which possess much interest apart from any hypothesis:

"To the observer, the action of a cause of disease exhibits itself in the disturbance of the proportion between waste and supply which is proper to each period of life. In medicine, every abnormal condition of supply or of waste, in all parts or in a single part of the body, is called disease.

"It is evident, that one and the same cause of disease will produce in the organism very different effects, according to the period of life; and that a certain amount of disturbance, which produces disease in the adult state, may be without influence in childhood or in old age. A cause of disease may, when it is added to the cause of waste in old age, produce death (annihilate all resistance on the part of the vital force;) while in the adult state it may produce only a disproportion between supply and waste; and in infancy, only an equilibrium between supply and waste (the abstract state of health).

"A cause of disease which strengthens the causes of supply, either directly or indirectly by weakening the action of the causes of waste, destroys, in the child and in the adult, the relative normal state of health; while in old age it merely brings the waste and supply into equilibrium.

"A child, lightly clothed, can bear cooling by a low external temperature without injury to health; the force available for mechanical purposes and temperature of its body increase with the change of matter which follows the cooling; while a high temperature, which impedes the change of matter, is followed by disease.

"On the other hand, we see, in hospitals and charitable institutions (in Brussels, for example) in which old people spend the last of life, when the temperature of the dormitory, in winter,

sinks 2 or 3 degrees below the usual point, that by this slight degree of cooling the death of the oldest and weakest males, as well as females, is brought about. They are found lying tranquil in bed, without the slightest symptoms of disease, or of the usual recognizable causes of death.

"Practical medicine, in many cases, makes use of cold in a highly rational manner, as a means of exalting and accelerating, in an unwonted degree, the change of matter. This occurs especially in certain morbid conditions, in the substance of the centre of the apparatus of motion; when a glowing heat and a rapid current of blood toward the brain point out an abnormal metamorphosis of the brain. When this condition continues beyond a certain time, experience teaches that all motions in the body cease. If the change of matter be chiefly confined to the brain, then the change of matter, the generation of force, diminishes in all other parts. By surrounding the head with ice the temperature is lowered, but the cause of the liberation of heat continues; the metamorphosis which decides the issue of the disease, is limited to a short period. We must not forget, that the ice melts and absorbs heat from the diseased part; that if the ice be removed before the completion of the metamorphosis, the temperature again rises; that far more heat is removed by means of ice than if we were to surround the head with a bad conductor of heat. There has obviously been liberated in an equal time, a far larger amount of heat than in the state of health; and this is only rendered possible by an increased supply of oxygen, which must have determined a more rapid change of matter."

But, despairing of doing justice by extracts to these speculations, we hasten to conclude this article by giving an abstract of his theory of respiration.

The change in the color of the blood which takes place in the lungs is one of the most familiar facts in physiology. It seems to be connected, in some way, with the iron contained in the red globules, and which is found in no other constituent of the body. The external agent concerned in this change is oxygen. The globules of arterial blood retain their florid hue until they reach the capillaries where they lose it. Venous blood in contact with oxygen is reddened, and the change, in either case, depends upon the globules which have the power of combining with gases. These globules take no part in the process of nutrition, and it cannot be doubted, therefore, that their office is to aid in respiration. They contain iron, and no

other metal can be compared with this for the remarkable properties of its compounds. Thus, the compounds of the *protoxide* of iron possess the power of depriving the other oxidized compounds of oxygen; while the compounds of *peroxide* of iron, under other circumstances, *give up* oxygen with the utmost facility. Now, in arterial blood the globules contain iron in the state of a peroxide—they are saturated with oxygen in the lungs. In the passage of the blood through the capillaries the peroxide of iron is reduced, by giving up a part of its oxygen to the carbon it there meets with, and in this way becomes a protoxide of iron, which combines with the carbonic acid just formed, and as a carbonate of iron passes on through the veins to the heart. When the globules reach the lungs, they will again take the oxygen they have lost; for every volume of oxygen absorbed they will liberate a corresponding volume of carbonic acid, and will be in a state to give off oxygen in the capillaries again. One purpose of the arterial globules is, to yield oxygen to certain constituents of the body, to produce the change of matter, determine the separation of living parts and their conversion into lifeless compounds, and aid in the formation of secretions and excretions. But the greater portion of the oxygen is employed in converting into oxidized compounds the newly-formed substances, which no longer make part of the living tissues. All the constituents present in venous blood, which have an attraction for oxygen, are converted, in the lungs, like the globules, into more highly oxidized compounds. From all of which it appears, that, in the animal organism, two processes of oxidation are going on—one in the lungs, the other in the capillaries. By means of the former, in spite of the degree of cooling, and of the increased evaporation which takes place there, the constant temperature of the lungs is kept up; while the heat of the rest of the body is supplied by the latter.

The frightful effects of sulphuretted hydrogen, and of prussic acid, when inspired, the author thinks are to be explained by the well-known action of these compounds on the preparations of iron. He says,

"Let us suppose that the globules lose their property of ab-

sorbing oxygen, and of afterwards giving up this oxygen and carrying off the resulting carbonic acid; such a hypothetical state of disease must instantly become perceptible in the temperature and other vital phenomena of the body. The change of matter will be arrested, while yet the vital motions will not be instantly stopped.

"The conductors of force, the nerves, will convey, as before, to the heart and intestines, the power necessary for their functions. This power they will receive from the muscular system, while, as no change of matter takes place in the latter, the supply must soon fail. As no change of matter occurs, no lifeless componds are separated, neither bile nor urine can be formed; and the temperature of the body must sink.

"This state of matters soon puts a stop to the process of nutrition, and, sooner or later, death must follow, but unaccompanied by febrile symptoms, which, in this case, is a very important fact.

"This example has been selected in order to show the importance and probable advantage of an examination of the blood in analogous diseased conditions. It cannot be, in the slighest degree, doubtful, that the function ascribed to the blood-globules may be considered as fully explained and cleared up, if, in such morbid conditions, we shall discover a change in their form, structure, or chemical characters, a change which must be recognizable by the use of appropriate reagents."

This view of respiration combines every quality that can be required in an hypothesis—it rests upon well-known observations, and explains all the phenomena of the process; it is probably, therefore, the true theory.

The appendix, the most elaborate part of Dr. Liebig's work, consisting of a great number of the most recent and exact analyses, and comprising the data upon which his conclusions rest, cannot, of course, be given, even in outline, in an analytical review. The work, we are sure, is destined to a wide and lasting popularity, and each reader will examine for himself the mass of curious and interesting details, upon which this beautiful system has been erected. To the chemist, the physiologist, the medical man, and the agriculturist, it is a volume of singular interest, shedding the brightest light upon every function of the animal system accessible to chemistry, and opening a path which has led to the most unexpected and astonishing results. Y.

Selections from American and Foreign Journals.

On the incipient Stage of Cancerous Affections of the Womb. By Dr. W. F. Montgomery.—In this paper the author directs the attention of practitioners to a stage of cancer uteri which precedes the two usually described by writers.

The *symptoms* are—sharp but comparatively fugitive lancinating pains in the back and loins, across the supra-pubic region, or shooting along the front of the thigh, or sometimes along the course of the sciatic nerve, producing numbness, and not unfrequently debility of the whole limb.

In a large proportion of the cases, there is found a decided fulness, or a distinct tumor in one or other iliac hollow, with fixed pain, and tenderness traceable to, and, as it were, issuing out of the abdominal ring; there is, generally, more or less irritation of the bladder, with dysuria, and the patient often complains of a sensation about the lower part of the rectum, which induces her to think that she is laboring under piles. Menstruation, though in some instances disturbed, is much more frequently quite regular in its returns; but there is apt to be bursts of hemorrhage, either accompanying the discharge, or occurring in the intervals; there is little, or no leucorrhœal or serous discharge, often none; and it is not until the disease has existed for a considerable time, that the appetite is impaired, sleep is disturbed, the flesh becomes softer and wastes, and the countenance pale, and expressive of distress.

On making examination *per vaginam*, the margin of the os uteri is found hard, and often slightly fissured, and projects more than usual, or is natural, into the vagina, and is irregular in its form.

In the situation of the muciparous glands, there are felt several small, hard, and distinctly defined projections, almost like grains of shot, or gravel, under the mucous membrane.

Pressure on these, with the point of the finger, gives pain, and the patient often complains that it makes her stomach feel sick.

The cervix is, in most instances, slightly enlarged, and harder than it ought to be. The circumference of the os uteri, especially between the projecting glandulæ, feels turgid, and to the eye presents a deep crimson color, while the projecting points have sometimes a bluish hue.

There is no thickening, or other alteration of structure in any part of the vagina, at its conjunction with which the cervix uteri moves freely; nor is there any consolidation of the uterus with the neighboring contents of the pelvis; in fact, the morbid organic change appears to be, at first, entirely confined to the os uteri and lower portion of the cervix.

This stage of the affection is, in many instances, *very slow*, lasting sometimes, *for years*, before the second and hopeless stage is established; during this time the patient experiences only comparatively slight and transient attacks of pain, or perhaps only sensations of uneasiness, referred often to the situation of one or other of the ovaries, or about the os uteri, with anomalous tingling along the front and inside of the thighs; these last for a few hours, or a day or two, and then disappear, perhaps for weeks; but again and again return in the same situation, and for a long time are not increased in severity; the patient finds that sexual intercourse now, occasionally, causes her pain, which she ascribes to some deep-seated part being touched, and the act is followed by an appearance of blood; she is, also, often troubled with slight irritability of the bladder; but the appetite, digestion, and sleep, may, for a long time, continue good, and the pulse, generally, gives no indication of the existing disease, or its changes; an observation which will be found applicable to many uterine affections of a grave character; in short, the general health may long remain quite undisturbed, nor has the patient, in many instances, the slightest suspicion that there is any thing seriously wrong with her, nor thinks of seeking for medical aid until she is induced to do so by the solicitations of her husband, or some anxious friend who has become, as she thinks, unreasonably alarmed about her state.

Dr. Montgomery thinks that the first discoverable change in the cases now alluded to "takes place in and around" the muciparous glandulæ, which exist in such numbers in the "cervix and margin of the os uteri;" these become indurated by the deposition of scirrhous matter around them, and by the thickening of their coats, in consequence of which they feel, *at*

first, almost like grains of shot or gravel under the mucous membrane.

Treatment.—In almost every instance, the treatment should be begun by the *local abstraction of blood*, either by cupping, or by leeches applied to the os uteri, or as near as possible to the organ; and their application will, in most cases, require to be frequently repeated, and should be accompanied by the free use of anodyne fomentations. *Venesection* is not, in general, required. Except there be something specially to forbid its use, *mercury* should be given, in some form, so as to bring the system very gently, but decidedly, under its influence; for which purpose it may be combined with iodine in very minute proportions, with camphor, opium, hyoscyamus, or hemlock; and occasionally by friction, especially where there exists evidence of inflammatory action in the iliac hollow, as already adverted to.

Afterwards, *iodine* or *hydriodate of potash* may be used both internally and externally; and *iron* will be found a most beneficial and powerful agent, especially in the form of the saccharine carbonate, or the carbonate given in the nascent state. The *iodide of iron*, which combines, to a certain degree, the powers of both remedies, may also be used with some advantage in most cases. *Counter irritation* is an agent of very great influence in this complaint, and may be established in a variety of ways, which it is unnecessary to enumerate; but a very effectual mode is by making a small blister over different parts in succession, and keeping it discharging freely for several days, by the application of the French dressing, or Albespeyer's papers.

After the removal of the congestion and organic changes from the os uteri, there remains, occasionally, a sensitiveness of the part, which causes the patient much discomfort, and which will be best relieved by the use of the bath, as above directed, conjoined with anodyne applications to the part, or the nitrate of silver in solution; the best mode of applying which, is by means of a bent glass tube of about an inch in diameter, which the patient can introduce and manage for herself; all that is necessary is, that she would lie on her back, and introduce the tube as far as its curvature, and then pour into the upper end the medicated solution, which will immediately pass to the os uteri, and can be retained there as long as necessary, the tube filling the vagina sufficiently to prevent its flowing away, which is a great advantage.

The patient should be strictly enjoined to avoid every thing that could stimulate the uterus—such as riding on horseback,

&c.; but, especially, she should refrain from indulgence in sexual intercourse. Wine, if used at all, should be of a very mild kind, and very sparingly taken, and the same rule should apply to malt drinks; the stronger kinds of ale and porter should be altogether prohibited.

No circumstance connected with the treatment of this affection requires more scrupulous attention than the regulation of the patient's habits and modes of living; indeed, if this be not very carefully managed, all other measures will most probably be defeated.

In illustration of the foregoing remarks, Dr. Montgomery relates several cases which terminated successfully under the treatment laid down by him. Further researches, however, are required to establish that the nature of the disease is truly cancerous.—*Prov. Med. and Surg. Jour.*, from *Dub. Jour. Med. Sci.*

Styptic Effect of Kreasote.—A robust countryman divided the ulnar artery with a sharp knife, the consequence of which was repeated bleedings, which, however, were staunched by surgical aid. Three weeks afterwards, hemorrhage returned, and Dr. Burdach of Luckan was sent for. He found the wound, which at first was a simple puncture, livid at the edges, and expanded to the size of the palm of the hand, by a spongy growth from the bottom. This spongy mass was in a gangrenous condition, and prevented the examination of the wound, the arm was swollen from the shoulder to the finger points; it could not be moved, and was excessively painful. Dr. Burdach had only the choice between actual cautery and kreasote left, for in such a state of the arm, tying the artery was out of the question. He poured ʒss of kreasote (*freed from eupion*) into the wound. This gave the patient no pain; nay, after it he enjoyed refreshing sleep for the first time after the accident. There was no more hemorrhage; the pouring in of the kreasote was repeated morning and evening, and the spongy mass gradually diminished, and three days afterwards, under the cooperating influence of bandages moistened with kreasote, ol tereb., and balsam. indic., loosened itself from the bottom of the wound. The divided artery was no more visible, the swelling of the arm decreased, and the complete cure shortly followed without any relapse.—*Lond. and Edin. Monthly Jour. Med. Sci.*, May 1842, from *Medicinische Zeitung*, Jahrg. 1840. No. 31.

The late Baron Larrey.—The death of Baron LARREY, which took place at Lyons on the 29th of July, has deprived French Surgery of one of its brightest ornaments. Few members of our profession have played so important and distinguished a part in the annals of both history and science, as the veteran Larrey. His career was connected with some of the most stirring events of the past half century, and his reputation belongs hardly more to his profession than to humanity.

JEAN-DOMINIQUE LARREY was born in 1766, in the village of Baudeau, in France. Left early an orphan, at the age of fifteen he was placed under the care of a paternal uncle, who practised surgery at Toulouse, with whom he spent seven years in the study of medicine. In 1787, he obtained the post of Surgeon in the Navy, and made a cruise to the colonies. Returning shortly after to France, in the midst of the excitement of the revolution, he became attached, as an *Interne*, to the hospital of the Invalids. After remaining some years, he obtained the rank of full-surgeon, and joined the army of the Rhine. Larrey soon signalized himself in the army by the introduction of the *ambulances volantes*, the improved transports for hospital stores, which have been found so useful in the French service. Larrey's services and his *ambulances volantes* were considered of so much importance, that, after the battle of Mayence, in 1793, they were publicly noticed in the bulletin issued by General Beauharnais.

In 1794 Larrey was appointed Surgeon-General, and repaired to Toulon, where commenced his intimacy with Napoleon, then a lieutenant of artillery. The school of military surgery at Val-de-Grâce had been previously established, and Larrey appointed a Professor; but professors and pupils were soon called to active service, and the school was suspended. In 1798, Larrey joined the army of Egypt. His account of the memorable campaign in Egypt and in Syria is familiar to every professional reader. Larrey accompanied Napoleon in nearly all his campaigns, and was honored by him with repeated marks of distinction. In 1812, he received the title of Surgeon-General of the *Grande Armée*. His fidelity to the emperor brought him into active service during the hundred days, and he was present at Waterloo, where he was wounded and made prisoner. During the restoration, M. Larrey's well known attachment to Napoleon, kept him under a cloud, but the revolution of 1830 restored him to the public service, to which he devoted himself to the close of his life. His death

at Lyons took place upon his journey home from the army in Algeria.

Baron Larrey's scientific was not less distinguished than his military career. His writings on military surgery have been long recognized as the highest authority on the subject, and certainly no surgeon of his day equalled him in the amount and variety of his contributions to practical surgery. In 1803 he published his "*Historical and Surgical Account of the Campaign of the Army of the East, in Egypt and Syria.*" In 1812, he published three volumes of his admirable "*Memoirs of Military Surgery and Campaigns,*" adding a fourth volume in in 1817. Besides these, Larrey published numerous other works, including four volumes of "*Surgical Clinique derived chiefly from Camps and Hospitals, from* 1792 *to* 1832."

The merit of the adaptation of the *immoveable apparatus* to the treatment of fractures and certain wounds of the soft parts, belongs, we believe, to M. Larrey. The advantages of this mode of treatment in the surgery of actual warfare can hardly be disputed, whatever may be our views of the practice under ordinary circumstances. In his last work, published shortly before his death, M. Larrey gives a new notice of the apparatus, and sets in a striking point of view the advantages of its adoption in military surgery.

Baron Larrey's writings possess the double attraction of historical and scientific value. An actor in scenes, the grandeur of which has never been surpassed, his narrations constitute not only invaluable records of practical surgery, but they, at the same time, form an interesting chronicle of a most eventful epoch of European history. On the great merit of Larrey's writings on military surgery, it is unnecessary to dwell. His immense clinical experience, derived from a theatre that has never been equalled in magnitude, gives them an importance and authority that it would be presumption to question. He was perhaps, in some respects, too pertinacious an adherent to the opinions of by-gone times, and did injustice to the importance of recent discoveries; but his works are all entitled to the praise of practical value, and are distinguished by a lucid detail of facts, a just discrimination of their relative importance, and the evidences of a sound judgment.

Larrey's career was as virtuous as it was memorable. He enjoyed, pre-eminently the confidence and respect of Napoleon, who spoke of him at St. Helena in the warmest terms. His allusion to him in his will is well known.

Baron Larrey was interred at Père-la-Chaise, with great so-

lemnity. A number of distinguished men followed him to the tomb, and orations were delivered by MM. Pariset, Breschet, and others. A subscription has been opened to erect a monument to his memory.—*Med. Examiner.*

M. Louis on Typhoid Fever.—We observe by the French journals that a new edition of M. Louis' well known work on this subject has recently been published in Paris. Its title deserves notice: 'Recherches Anatomiques, Pathologiques et Therapeutiques sur la Maladie connue sous les Noms de Fievre Tyhoide, Putride, Adynamique, Ataxique, Bilieuse, Muqueuse, Gastro-enterite, Enterite Folliculeuse, Dothinenterite, &c., comparée avec les Maladies Aigues les plus ordinaries!' Does not this alone indicate how bewildered the ideas of medical men must still be on the all important subject of fever? We had almost hoped that M. Louis would by this time have found reason to modify his opinion as to the seat or proximate cause of typhoid fever being in the intestinal canal; but we find that we are mistaken. He still maintains, and even in more decided terms than ever, that 'the anatomical character of the typhoid affection (a very stupid phrase) consists in a morbid alteration of the intestinal, chiefly the Peyerian glands; and, also, that any secondary lesions are very usually of an inflammatory nature.'

This doctrine is a most fallacious, and unfortunately at the same time a most hurtful, one. While we admit that the intestinal lesions seem, from all accounts, to be of much more frequent occurrence in fever as it occurs in France, than as it is seen in this country, we most confidently deny that they are uniform or constant even in the former case—at least if we can trust the testimony of such men as Chomel and Andral. But even admitting the frequency of intestinal lesions in fever, does it necessarily follow that they are the consequences of simple inflammatory action, as asserted by Broussais, Louis, Bouillaud, and others of this school? Do we observe the same phenomena on dissection in typhus as are found in fatal cases of genuine enteritis? Assuredly not. The patchy redness in different parts of the canal, the tumefied and softened condition of the mucous and submucous tissues, the enlargement, ulceration, and even sphacelation of the follicular glands, &c., cannot surely be admitted as the legitimate evidences of a pure phlegmasia. They might rather be regarded as the results of the irritation of unhealthy acrid secretion on the mucous

surface than as the primary and essential phenomena of the disease. But without going so far as this, we have no hesitation in asserting that the intestinal lesions, however frequent they may be in the fevers of Paris, can only be viewed as one of the changes induced by the general disease of the system. To apply the term of *enteritis* to such lesions is not only incorrect in theory, but most pernicious in practice. It has been from the too general adoption of this dogma by the present generation of medical men in France, that so many and so serious errors have been committed by them in the treatment of their patients. When we read the grave discussions that are frequently agitated in the Academy of Medicine of Paris, on the results of some novel mode of treating typhoid fever, what are we to expect from the young surgeons and physicians who are annually drafted away either to the country, or perhaps into the army and navy, immediately after having had their heads crammed with the 'nouvelle doctrine' as taught by the professors of the physiological school!

Part of M. Louis' work is taken up with showing that 'jail-typhus and typhoid fever are identically the same disease.' What rational man ever doubted it? But such are the vague opinions of French medical men on the subject of fever, that M. Louis deems it necessary to devote an entire chapter to prove a position, which has been recognized as an acknowledged truth by British practitioners ever since, and indeed long before the days of Huxham. But then it is at the same time well known that almost every epidemic of fever, whether it appears in jails or other crowded buildings, or in the lanes and dirty alleys of a city, exhibits some peculiarity or other by which it may be characterised; and yet no sensible physician would dream of designating one epidemic as cephalitis, another as bronchitis, a third as gastro-enteritis, merely because the predominant symptoms may be at different times seated in the head, chest, or abdomen. Until medical men can be induced to carry their thoughts beyond the more obvious lesions discoverable on the dissection of patients who fall a victim to typhus fever, they will ever remain involved in a labyrinth of perplexities, which will only be increased by a more extensive acquaintance with the disease. A calm unprejudiced examination of the history of typhus must lead every one, we are inclined to believe, to the conviction that it is the result of an invisible atmospheric agent—call it miasm, malaria, matter of contagion, or what you will—on the human body, acting primarily on the nervous system, and often ra-

pidly absorbed into the system, thereby inducing a more or less decidedly vitiated state of the circulating fluids.

The lesions of the viscera, whether of the cranial, or of the thoracic or abdominal cavities, are all secondary or consecutive phenomena of the disease; their occurrence being attributable either to the contemporaneous influence of other atmospheric agencies, to the idiosyncrasy, habits, and previous state of health of the patients affected, or perhaps to the differences in the nature and degree of the aerial poison that has been introduced into the system. We must admit that, in taking this view of the question there are many points that cannot be demonstrated by actual proofs, and that the theory is essentially based upon a mere probability; but let us remember that there is, and ever will be, much in the history of these diseases, especially those of an epidemic and diffusive character, that must defy the scrutiny of human observation: we cannot *exhibit* the infectious poison of scarlet fever, or of measles, or the miasma which gives rise to intermittent or remittent fevers; and yet no one disputes their existence. It is therefore a very insufficient reply to be told that we cannot demonstrate our theory of the disease. Some modern French writers are constantly trying to make us believe that medicine is capable of being rendered an *exact* science, and that we must not admit any positions in our reasonings on disease but what can be proved by actual observation. This is a most foolish and dangerous doctrine. As in moral and political philosophy, so in medicine, there are no permanently fixed and unalterable rules which are inevitably true at all times and under all circumstances. The beauty of a moral precept or the expediency of a political maxim may charm the mind in theoretical speculation; but in our practical dealings with the world, we find, alas! that the line of conduct to be adopted must greatly depend upon the circumstances of each case —ever striving however to act on the principle of doing unto others as we wish them to do unto ourselves.

Dr. Landouzy, of Rheims, the reviewer of M. Louis' work in the French Medical Gazette, states that his own experience in the late epidemic of jail-typhus in that town confirms the opinion that it is analogous, if not identical, in nature with the typhoid fever of the metropolis, and he bases his opinion on the circumstance of the *constant* existence, in all cases and at all periods of the disease, of the intestinal lesions in both forms of the fever. Yet, strange to say, he informs us that in no case were there any symptoms of such lesions during the

life: 'la diarrhée, la douleur abdominale, le meteorisme et le gargouillement ne se sont jamais rencontrés.' How can Dr. Landouzy, or any other sensible man, in the face of such a statement as this, continue in the belief that the disease, in which these symptoms were absent, was an inflammatory affection of the mucous coat of the bowels; in other words, that it was a 'gastro-enterite,' or 'dothinenterite.' He suggests, as a novel idea, that the difference in the symptoms of typhus fever in different times and seasons may be connected with some difference in the type or genus, as he calls it, of the disease, and very coolly remarks that 'the observations of authors on this point of pathology having in truth but little or no value until the 'beaux travaux' of M. Louis have become generally known, we must wait for new epidemics of typhus before we can offer a positive opinion upon the subject.'

Has Dr. Landouzy never heard of Sydenham or Huxham, or of Cullen, or of his own countryman Pinel, not to mention a century of other authors, who have all insisted upon this essential fact connected with the history of fevers—the differences in the character of the disease according to what has been demonstrated the 'medical constitution' of the season? Little is the wonder that the French are making discoveries in medicine almost every day: they seem to be utterly unaware of their own well expressed motto, 'nothing is so new as that which is forgot!'

The therapeutic portion of this edition of M. Louis' work has received, we are informed, 'd'immenses developpemens;' but the reviewer does not tell us particulars; all that he says is, that 'the author *seems* to prefer in the greater number of cases the use of evacuants to any other remedies.' The little word *seems* (semble) implies, if we are not much mistaken, a mighty deal in reference to M. Louis' mode of treatment. It is well known that this gentleman, however high he may be regarded as a morbid anatomist, cannot be appealed to as an authority on practical subjects. Some years ago, as we have noticed in a former article, he made the important discovery that bloodletting and blistering had little or no efficacy in subduing pneumonia! He has probably extended the application of this discovery to the treatment of fevers, and may have found out that by far the best mode of managing them is to do nothing.

In this respect his example offers a marked contrast with that of M. Bouillaud, a disciple of the same pathological school, whose 'grande decouverte' is the 'nouvelle formule' of bleeding 'coup sur coup,' so as to 'juguler' the disease at

once!! But we trust that it is quite unnecessary to expose the fallacy of this gentleman's views at present, as we have so repeatedly of late years cautioned the English reader against the errors into which he is apt to lead the inexperienced by the bold and confident manner with which he proclaims his marvellous success.—*Med. Chir. Review.*

Ligature of the primitive Iliac Artery.—The primitive iliac has been lately tied with entire success, at the Pennsylvania Hospital, by Dr. Edward Peace. We are enabled to present our readers with the following particulars of the case.

Israel Jones, a labourer, was admitted into the surgical wards of the Pennsylvania Hospital on the 22d of August, 1842, for an inguinal aneurism of five months standing. Five months previous to his entrance he strained his right groin, while lifting a heavy stone. A few days subsequently a hard tumour, about the size of a pea, made its appearance, which became as large as a walnut in the course of a month, and continued to increase until the end of the fourth month, when it attained its maximum growth. There was pulsation about the third or fourth week. About the beginning of the fourth month numbness and pain commenced in the tumour, and extended along the anterior portion of the thigh. The latter symptoms were always aggravated by exercise, and abated by rest. The man continued his daily occupations until three weeks previous to his entering the Hospital, when his sufferings became so great as to oblige him to desist. The pain at this period was so acute as to deprive him of sleep, and obliged him to maintain night and day a sitting posture, with his leg flexed on the thigh, and this on the pelvis; the whole limb resting on its exterior aspect. The tumour was large and irregular, hemispheroidal, and was, at least, two inches in height, its vertical diameter five and a half inches, and the transverse diameter about the same. It appeared to involve nearly all the right external iliac, together with some two inches of the femoral artery of the right side.

The man was an excellent subject, in the prime of life, robust, temperate, and uniformly healthy.

The operation was performed on the morning of the 29th of August, by Dr. E. Peace, assisted by his colleagues, Drs. Randolph and Norris, and Dr. J. Rhea Barton, and occupied forty-seven minutes. It was performed in the following manner:—A semi-elliptical incision was made, commencing

over the anterior spinous process of the ileum nearly on a level with the umbilicus, and directed obliquely downwards to within half an inch of the external abdominal ring, and nearly parallel to Poupart's ligament. The incision was seven inches in length. The integument, the fascia of the external oblique, the external oblique, and the fascia of the internal oblique, were divided with the bistoury. The transversalis and internal oblique muscles were now exposed, and with the aponeurosis were divided on a director. The peritoneum was then separated with some difficulty, and the vessel brought into view.

The vessel was taken up about half an inch above the bifurcation, the ligature being passed around it very readily by means of Gibson's needle. Pulsation and pain ceased in the tumour the moment it was tied.

Numbness of the limb and foot, and insensibility, particularly of the toes, supervened immediately. Numbness continued to some degree, with occasional intervals, throughout the first two weeks. Sensibility gradually increased until the third day, when it was entirely restored, even in the toes. The limb below the knee became sensibly cold within an hour after the operation. It was immediately enveloped in carded wool, and recovered its natural temperature, as far down as the ankle, within the first twelve hours. At the end of twenty-four hours warmth had returned in the foot—the toes only remaining below the proper standard of heat. As the heat returned in the limb it augmented, so as to make it really warmer than the sound one, which continued to be the case during the first two weeks.

The capillary circulation in the the toes continued sluggish until the sixth day, when it appeared to be entirely restored to activity. The man experienced slight pain, with the numbness, from time to time in the affected limb, but did not suffer materially until about the middle of the second week. At this time he complained of severe pain, beginning at the toes and darting up into the tumour. This pain was relieved by the application to the tumour of lint wet with laudanum. The tumour, which had previously been rather soft, at this time became much more dense, and decidedly smaller.

No other symptom worthy of especial note presented itself, except some tumefaction of the leg, which occurred on the fifteenth day and subsided in two days.

The wound was dressed on the fourth day, and every day thereafter. The discharge was always healthy and very moderate. The man's appetite excellent, and general health im-

proved. One-half of the wound united by the first intention; and the whole wound, except the sinus occupied by the ligature, had cicatrised within the first two weeks.

The ligature came away on September 27th, the *thirty-fifth day*. The patient is now allowed to sit up, and is doing extremely well.

The man experienced great relief from the numbness and pain, in repeated friction of the whole limb, (and especially the foot, which suffered the most in this way,) with soap liniment.

This, we believe, is the ninth time the primitive iliac has been tied. It was first tied in 1812, by Professor Gibson, of the University of Pennsylvania, for a gun-shot wound. The patient died from peritoneal inflammation on the thirteenth day. 2. By Professor Mott, in 1827. The ligature came away on the eighteenth day, and the patient recovered. 3. By Sir Phillip Crampton, in 1828. Death on the fourth day from hemorrhage. 4. By Mr. Liston, in 1829, for secondary hemorrhage after amputation. The patient, who was 8 years old, died. 5. It was tied in 1833, by Mr. Guthrie, for supposed gluteal aneurism. The operation was successful. The patient died eight months subsequently, and the disease proved to be a medullary tumour. 6. In 1837, Mr. Salomon, of St. Petersburg, tied the primitive iliac with success. 7. Mr. Syme, of Edinburgh, performed this operation in 1838. The patient died on the fourth day. 8. By M. Deguise, at the hospital of Charenton, Paris, in 1840. Successful.

Note.—Dr. Reeve, the Editor of the American Edition of Cooper's Surgical Dictionary, states that the primitive iliac was tied about six or seven years ago by Professor Bushe, in a child two months old, for congenital aneurism of one of the labia. Death occurred from abscess of the knee-joint in a few weeks.—*Philadelphia Medical Examiner.*

Devilliers and Chailly on Auscultation in Pregnancy.—To determine the position of the maximum intensity of the double sounds of the fœtal heart, we divide the abdomen into four parts by two lines crossing one another perpendicularly at the umbilicus, one falling from the extremity of the xiphoid cartilage to the symphysis pubis, the other running horizontally from side to side. In cranial presentations, the sounds will be heard most intensely below, in presentation of the pelvic extremity above the transverse line; the precordial region being nearer to the head than the pelvis. It is very diffi-

cult to diagnose presentations of the trunk, inasmuch as the sounds being heard below the transverse line, they may be confounded with cranial positions. The maximum intensity of the sounds on the right or left of the perpendicular line indicates a right or left position of the head. The more distinctly the sounds are heard in the median line, the greater is the probability that the abdomen of the child is directed anteriorly. In the opposite position the sounds are heard more clearly in a lateral situation. But these signs, especially in the latter case, are very difficult, and we are often obliged to have recourse to other means to assist in the diagnosis. A table is added, according to which a correct diagnosis was formed by auscultation in 223, a false one in 68 cases of pregnancy. The large proportion of the latter was owing to the difficulty in determining the anterior or posterior, and right or left positions of the child.—*London Med. Gaz.*, from *Revue Médicale.*

Post-Mortem Examination of a Soldier one hundred and two years old.—This man had taken part in numerous campaigns, and had never suffered from illness. He retained his bodily powers up to his hundredth year, but gave up from decrepitude and mental incapacity fifteen months previously to his death, and was received into the Military Hospital of Bradenburgh. His death occurred unexpectedly and without premonitory indication.

On examination, thirty-six hours after decease, the body was found moderately stout; the few hairs that remained were silvery; his teeth had long since quitted their sockets, the alveolar processes of the jaws were completely absorbed, and the mouth contracted in size. The opening of the cranium was rendered difficult by the thickness of the bones and their adhesion with the dura mater, and the latter was dense and tendinous. The brain was normal, its arteries converted into bony tubes; the pineal gland was filled with calcareous matter, and the choroid plexuses were vesicular. The larynx and carotida were completely ossified. The thorax large and well formed; lungs perfectly sound; heart normal; valves remarkably ossified; large arteries converted into ossific tubes; costal cartilages almost completely ossified. The liver, spleen, and kidneys presented a state of extreme softening, greater than could be referred to decomposition, and which can alone be explained on the supposition of excessive debility of the vital powers.

Thus the kidneys consisted of a semifluid granular mass, although the urine was natural and unclouded. The gall-bladder was distended with upwards of five hundred concretions, of various magnitude, and its coats were so soft that they became ruptured by the slightest touch. No symptoms of this collection had existed during life.—*London Lancet*, Aug. 13, 1842, from *Medicinische Zeitung*, 1842.

Lime Moxa.—Lime has been employed by Dr. Osborne as a moxa.

It is used as follows: A little quicklime, to the depth of half an inch, is put within a *porte moxa*, or a circular piece of card, and applied to the skin; water is then dropped on it, and mixed. In about two minutes it swells, and an intense heat is given out. It has been calculated that the heat produced is equal to 500° of Fahrenheit. If it is kept on as long as the heat continues, the whole skin is destroyed; but by removing it sooner, an issue to any extent may be formed. Dr. O. prefers this kind of moxa, from the great heat suddenly produced, and from no fire or sparks being seen, so as to alarm the patient. To ascertain the depth to which this moxa acts, he applies it to the surface of an egg, and then observes the thickness of coagulated albumen formed beneath. The size of the ulcer formed is always twice as large as that of the lime applied. When the lime is prepared from calcareous spar, the heat produced on the addition of the water is sudden and intense, and the pain is proportionately urgent. For ordinary purposes, however, well-selected pieces of lime, from a lime-kiln, answer well if *fresh*, but not otherwise.—*Lond. and Edin. Monthly Journ. Med. Sci.*, March, 1842.

Sciatica cured by Extract of Belladonna.—The following interesting case is related in the *Bulletin Thérapeutique.*

A lieutenant in the French navy had long laboured under a very severe form of sciatica; the pain extended from the sciatic notch to the terminal branches of the nerve in the foot, and was of the most violent kind. Several remedies had been tried without effect, when M. Hiriart resolved on employing the extract of belladonna. The bowels were first cleared out by an active purgative; and the whole limb was then rubbed, several times during the day, with an ointment composed of

one part of the extract to two of lard. After the fourth friction the patient experienced a creeping sensation in the limb, and some slight symptoms of narcotism appeared; he enjoyed, however, some sleep during the night. On the following morning the pain had shifted to the opposite limb, whence it was driven by the same means. The state of the bowels and stomach was regulated by gentle purgatives and proper diet, and in a short time the patient was completely cured of a disease from which he had previously suffered the most cruel torments.—*Prov. Med. and Surg. Journ.*, March 26, 1842.

Removal of Discoloration of the Skin from Nitrate of Silver.—Dr. Patterson considers that "there can scarcely be a doubt, that in those cases, where the skin has become discoloured from the long use of nitrate of silver, the discolouration may be removed by the internal and external employment of suitable preparations of iodine."

The following is the formula which Dr. Patterson employs for the administration of the ioduret of silver.

℞. Iodureti Argenti,
Nitratis Potassæ, *aa* gr. x.,
Tere simul ut fiat pulvis subtil., dein adde
Pulv. Glycyrrhizæ ʒss.
Sacchari Albi ʒj.
Mucil. Arab. q. s. M.
Fiant pil. xl. quarum sumat æger j. ter in die.

Employment of the Ergot of Rye in Cases of Paraplegia. By M. Payan, of Aix.—M. Payan begins by stating that he has recenntly sought to demonstrate that it was wrong to consider ergot of rye as a simple excitor of uterine contractility; that facts prove that ergot acts on the rectum, the bladder, and the inferior extremities, when these parts are in certain asthenic conditions, in the same manner as on the womb in cases of uterine inertia; and that, not being able to attribute rationally to this agent specific effects on parts of the body essentially different, he was obliged to seek for its action still further, and to refer it to some organ holding still under its influence these different parts. M. Payan has discovered that it is on the spinal marrow that the ergot exercises a special and primitive action.

This fact being established, it became evident that we ought to recur to the use of ergot in paraplegias and debility of the inferior extremities, proceeding from causes which have suspended or weakened the action of the spinal marrow, without having altered its texture.

M. Payan adds the three following facts to those which he has already published, and which demonstrate the justice of his views:

1. A man of 40 years, fell on the perineum, and paraplegia was the consequence. The patient, treated at Marseilles, was completely cured. Some time after, in a journey which he made to Aix, he again experienced the same symptoms, and entered the Hotel Dieu of that city. In the absence of M. Payan opiate liniments, blisters, &c., were unsuccessfully used against the paraplegia. The case then came under M. Payan's care, who substituted for these means one gramme* of the ergot to be taken once. Twelve hours after the paralyzed limb became agitated frequently by muscular starts, and he daily recovered strength. At the end of six days the patient could walk with the aid of a single crutch. During a fortnight the ergot was administered in the dose of two grammes. A month after, the treatment having been suspended on the fifteenth day, on account of the appearance of some slight gastric derangement, the amelioration persisted, but the patient left the hospital.

2. A man of 30, attacked with a complete paraplegia, committed himself to the care of M. Payan. A number of energetic measures had already been tried. This was his state when he was submitted to the observation of this skilful physician.

The two lower limbs support well enough the weight of the body; but he finds it impossible to walk any time without sitting down; unless he does so he infallibly falls. The right lower extremity is strong enough, but insensible; the other limb is sensible, but a little atrophied. The bladder has lost a part of its contractility.

A gramme of the ergot was administered every morning. At the end of a few days the dose was increased to two grammes. At the same time frictions with a stimulating liniment were made along the spine. After eighteen days the two lower extremities had become strong, and the patient could return into his country.

3. A workman, having endured a severe paraplegia, the

* Equivalent to 15 grs. English.

consequence of a bad attack from lead, different means had failed to relieve the malady; the ergot completely triumphed over it.

From these three cases M. Payan not only infers the efficacy, but, moreover, the complete innocence of this medicine, which has been ordered for six weeks without any accident, which this year has been given for forty consecutive days, in doses of forty to eighty centi-grammes, to a young girl five years old, without her being the least injured by it.—*Dub. Jour. Med. Sci.*, from *Journ. de Pharm.*

The employment of Strychnia in Amaurosis.—A laboring boy, 12 years old, received a blow in the right supra-orbital region, by the falling of a pewter vessel which he was endeavoring to remove from a high shelf. At the moment of receiving the blow he perceived a flash of light in the eye, but could see nothing with it afterwards. In three hours he came under the care of Dr. Dusterberg, of Lippstadt. Immediately above the right eye-lid was visible a small blue spot, of the size of a horse-bean. In the eyeball itself nothing abnormal could be detected, no trace of opacity or extravasation of blood. The pupil acted naturally, as in the sound organ, but the power of vision was entirely lost in the right eye; so that he was unconscious when it was directed toward the full glare of the sun. He was treated for two months with bleeding, cold applications, mercurial frictions, blisters, drastics, emetics, electricity, and even the frontal nerve was divided; but all in vain; the amaurosis did not in any degree yield. Subsequently a solution of a grain of nitrate of strychnia in half an ounce of rectified spirit of wine was dropped into the eye four or five times daily: the result of which was, that, in fourteen days, sensations of light were experienced in the affected eye, which, under the continued use of the remedy, increased so that he was enabled to distinguish colored objects. After a period of three months, the power of vision had so far returned that he could recognize bodies at a distance of three feet. At this point the improvement stopped, notwithstanding that the dose of strychnia was increased, and its endemic application had recourse to. The case, however, may be fairly adduced to show the beneficial influence of strychnia on torpid amaurosis.—*Lond. Med. Gaz.*, Aug. 5, 1842, from *Schmidt's Jahrbücher.*

THE WESTERN JOURNAL.

Vol. VI.—No. V.

LOUISVILLE, NOVEMBER 1, 1842.

KANE'S ELEMENTS OF CHEMISTRY.

Professor Draper has rendered an acceptable service to American students of Chemistry, by giving them this edition of Dr. Kane's admirable work, with alterations, adapting it better to the system of instruction pursued in this country. We have no hesitation in agreeing with the editor, that, as a text-book, it is the best work extant in the English language. It represents the present condition of chemical science, and exhibits its applications to pharmacy, medicine, and the useful arts. In a work of so great detail much is given in which the student can feel but little interest. Dr. Draper has had the details printed in a smaller type, by which the learner will be able to distinguish the parts embracing the leading principles upon which he will bestow his first attention. The mechanical execution of the work is excellent. It contains a great number of wood cuts, which will materially aid the student in comprehending processes. So rapid is the march of chemical science, especially of organic chemistry, that it must be posted up at short intervals. New publications are demanded every year to bring up the improvements. Kane's Elements embrace an account of many which are not to be met with in previous

works on chemistry, and it will be found that he has adapted his work admirably to the wants of medical men, by pointing out the connexion, where any existed, between his subject and pharmacy, physiology, or pathology. Y.

PHRENOLOGY AND NAPOLEON.

Napoleon's bust, as it is to be seen in phrenological cabinets, must have struck every one as very unlike the head of a great warrior. In fact, it is a very *mediocre* thing, and we have always felt, that, if it represented faithfully the size and form of the emperor's head, it was exceedingly out of place in a phrenological cabinet, since it set fairly at defiance every principle of organology. We have heard various attempts at explaining the discrepancy. It has been said, that, after Napoleon's exile to St. Helena, his brain shrunk from inaction, and that, consequently, the bust taken after his death does not give the proportions of his head as it was in the prime of his life. Another explanation is, that Antomarchi was an *anti-phrenologist*, and published a false bust of his illustrious patient. The true account of the matter is probably given in the following anecdote, which we lately met with in a biographical sketch of Dr. Graves, of Dublin, and for which we are sure he will receive the thanks of all phrenologists.

"When Napoleon died, there was no plaster of Paris in St. Helena, and no one who knew how to take a plaster bust of the emperor, which he had never allowed any one to do during his life (why, it is difficult to say). The emperor's suite expressed great regret at this circumstance, in the presence of Doctor Burton of the 66th regiment, a relative of Dr. Graves (who had all the particulars from him). Doctor Burton had assisted in the post-mortem examination of Napoleon—his name is to the attested certificate of that investigation—and when he heard these expressions of regret, he offered to make all possible efforts to form a bust, on the condition, that if he succeeded he should have the original, and the emperor's attendants a copy. He had in so hot a climate, to hasten his operations, and was out all night in a boat seeking sulphate of lime (gypsum), which he had previously observed in veins on the rocks near the shore. He collected a sufficient quantity, prepared it, and after much labor succeeded in taking an excellent cast of Napoleon's bust. Next evening he went to town, having labored all day, to take some refreshment in his quarters, leaving the mould at Longwood. Some of the officers, hearing from him what he had done, said he would never see the mould again. To this he

answered, that he did not believe any effort would be made to rob him of his rights, which he had taken care to verify by a written contract; but when he returned to Longwood, he found the mask or face part of the mould had been stolen. The rest was left—its use either being not understood, or being too heavy to get away privately. No entreaties of Dr. Burton were availing to recover the mask. Madame Bertrand said she would never permit an "Englishman to *publish* the emperor." This mask was published by Antomarchi, Napoleon's physician, and not only the mask but the whole bust. Except the mask, every other part was fictitious, as Doctor Burton secured the rest, and yet throughout Europe, the imaginary bumps, in this supposed cast of Napoleon's cranium, have proved quite satisfactory to phrenologists as affording undoubted proofs of the accuracy and truth of their science. Doctor Burton died suddenly on parade, at Canterbury, while doing duty with a regiment of hussars to which he had been appointed surgeon; and the mould, there is too much reason to believe, was destroyed in his quarters; his servants being ignorant of its value." Y.